VOLUME XXXIV, NO. 180 MAY-JUNE, 1950

ORDNANCE

☆ LAND
☆ SEA
☆ AIR

Title registration applied for

GENERAL J. LAWTON COLLINS
Chief of Staff, United States Army

In This Issue

Our New Ordnance
Gen. J. Lawton Collins

Debt and Defense
Lewis H. Brown

Officers in Industry
Maj. Gen. L. C. Craigie

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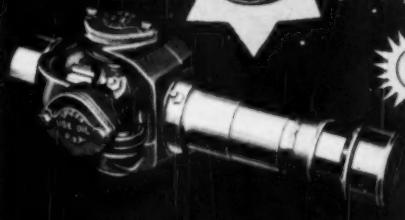

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The Magazine of Scientific and Industrial Preparedness

Vol. XXXIV MAY-JUNE, 1950 No. 180

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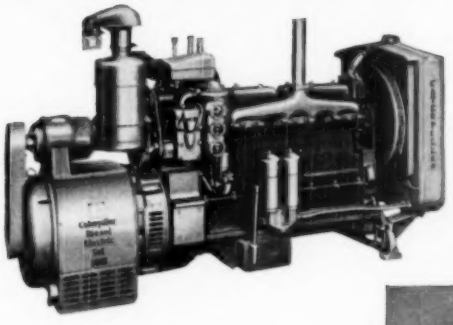

Radio, radar, ground-control-approach can have no surer operating power than is offered by "Caterpillar" Diesel Electric Sets. Thousands of these units have proved themselves through long unfailing performances in government installations. Their outstanding records stem from a rugged simplicity of design that leaves little chance of things going wrong.

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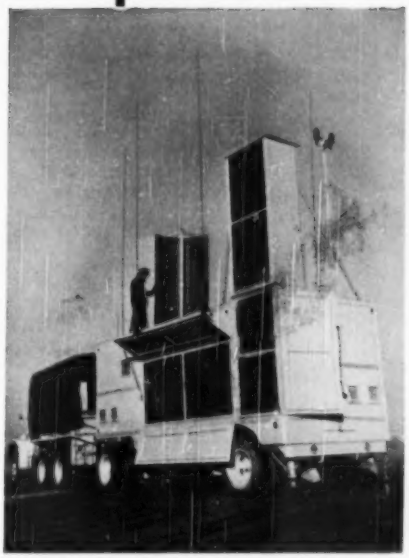

FLOYD BENNETT FIELD, NEW YORK. A mobile ground-control-approach unit (GCA) at the Navy's Floyd Bennett Field. Radar equipment is housed in the trailer while the truck contains two "Cat" D3400 Electric Sets.

NAVAL AIR STATION, OAKLAND. Extensively trained in radar and operating ground-control-approach (GCA) equipment, a small group of men bring the planes in safely—even in foulest flying weather. This GCA unit is similar to that described for Floyd Bennett Field. Two "Cat" D3400 Electric Sets provide steady, dependable power.

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THE NEW Fairchild Packet exemplifies the continuous teamwork between the U. S. Air Forces, Air Materiel Command and the aircraft industry. As always, Air Materiel Command aeronautical experts worked closely with Fairchild designers and engineers to develop the Packet—now setting new military standards for efficient movement of cargo and personnel.

Air Force requirements called for a practical cargo and personnel carrier, versatile enough in design and operation to make it efficient for a variety of missions. The C-119, expertly tailored to fit these requirements . . . carries cargo and personnel, tanks, guns and vehicles, ammunition, rations, fuel and countless other bulk items. The Packet is also ideally suited to drop paratroopers and evacuate wounded.

An advanced version of the famed Fairchild C-82, the new, larger and faster C-119 is the result of imagination and engineering skill and production ability.

The Air Force and Navy will use these aircraft for numerous transport assignments. C-119's will play a vital role in the ever-expanding field of military air operations. Here is another Fairchild "first" in air transportability!

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Armed Forces Day
20 May 1950

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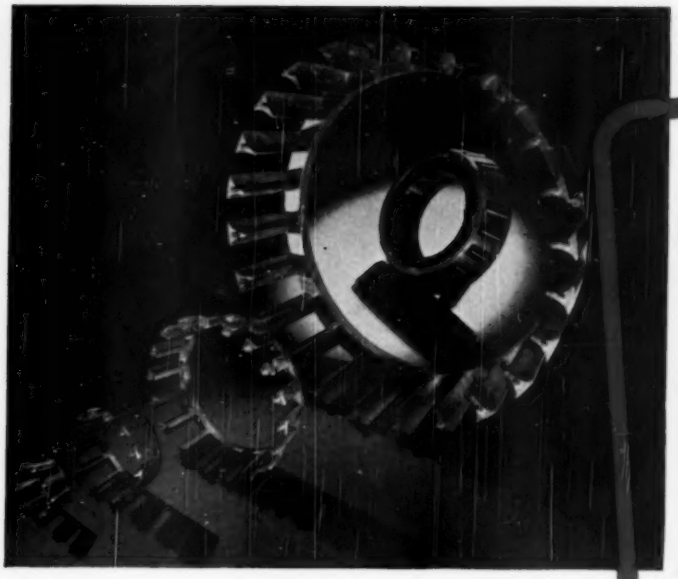

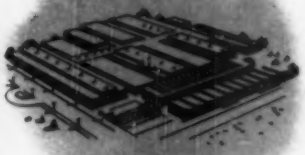

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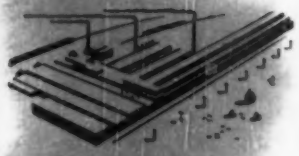

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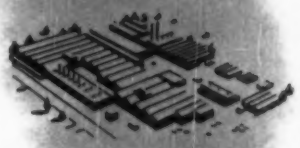

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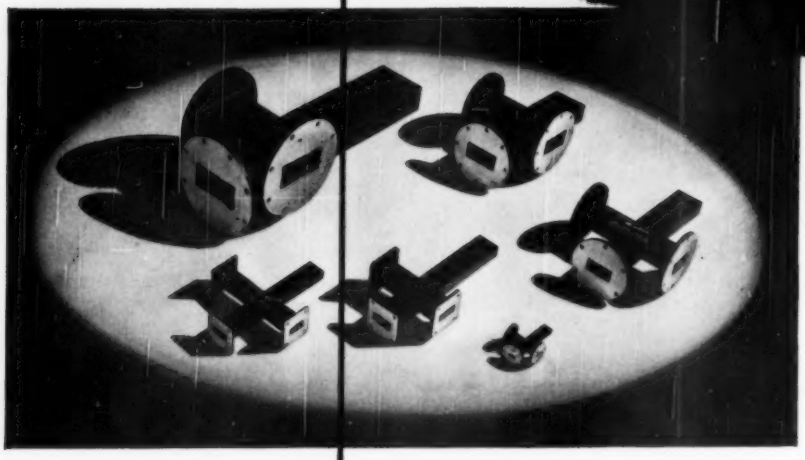

■ Sperry has a complete line of Cross-Guide Directional Couplers for all frequencies ranging from 2600 to 40,000 mc. These couplers are superior to other types of directional couplers in high directivity and unusually uniform coupling characteristics.

■ The coupling varies less than 3 db over the entire useful frequency band of the waveguide transmission line, whereas other types of couplers have attenuation which varies rapidly with frequency. Calibration accuracy on these instruments is ±0.5 db through the quoted range. Operating temperature range is from −40° to +55° C and humidity effects are negligible.

■ Cross-Guide Directional Couplers, part of Sperry's MICROLINE*, are versatile, precision instruments well adapted for general laboratory and production test work. They differ in appearance only in their external dimensions. Each consists of two rectangular waveguides, a primary and secondary guide, joined perpendicularly to each other. Coupling is provided by slots cut in the common wall between the waveguides. One end of the secondary waveguide is terminated in a matched load.

■ In addition to the superior electrical properties of the Cross-Guide Directional Couplers, they are also physically constructed for convenient assembly into a waveguide system. Our Industrial Department will be glad to give you additional information on these as well as other MICROLINE instruments.

ELECTRICAL CHARACTERISTICS			LINE AND CONNECTOR TYPES		
Model No.	Frequency Range (Kmc)	Nominal Coupling (Db)	Waveguide		Connectors Both Arms AN Type
			AN Type	Size (in. O.D.)	
306	2.6-4.0	30	RG-58/U	3x1½x.080	UG-214/U
233	4.0-6.0	24	RG-49/U	2x1x.064	UG-149A/U
321	4.0-6.0	30			
322	4.0-6.0	40			
209	5.3-8.1	24	RG-50/U	1½x¾x.064	UG-344/U
237	5.3-8.1	30			
235	8.1-12.4	20	RG-52/U	1x½x.050	UG-39/U
236	8.1-12.4	24			
234	8.1-12.4	40			
388	12.4-17.0	20	RG-91/U	.702x.391x.040	UG-419/U
413	18.0-26.5	20	RG-53/U	½x¼x.040	UG-425/U
415	18.0-26.5	40			
405	26.5-36.0	20	RG-96/U	.360x.220x.040	UG-381/U

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NI-RESIST...
AN ECONOMICAL METAL

for resisting Corrosion, Erosion and Metal-to-Metal Wear

NI-RESIST* is the trade name of a high nickel cast iron – one of the most economical corrosion-resistant engineering materials ever developed.

NI-RESIST, mechanically similar to gray iron, and resembling austenitic stainless steel in many characteristics, provides a unique combination of properties at moderate cost . . .

RESISTS CORROSION

NI-RESIST resists corrosive attacks of *acids, alkalies* and *salts* to a degree unmatched by any other product of the cast iron industry. In strong corrosives it has 20 to 200 times the resistance of plain iron, and 5 to 50 times the resistance in mild environments.

CURBS WEAR

NI-RESIST reduces wear and galling, because graphite particles are distributed throughout its structure, as in gray iron. From this, and its work-hardening characteristics, come the superiority of NI-RESIST castings for components in metal-to-metal wear service.

CHECKS EROSION

This superior wear-resistance . . . together with inherent resistance to corrosion . . . makes NI-RESIST an outstanding material for curbing erosion by liquids and slurries. By long, trouble-free control of erosion, NI-RESIST castings reduce maintenance costs, production tie-ups and the expense of replacements.

WITHSTANDS HEAT

Although primarily used to resist corrosion, erosion and metal-to-metal wear . . . NI-RESIST is also specified for resistance to elevated temperature effects. Castings of NI-RESIST show up to 10 times better scaling resistance, and up to 12 times better growth resistance than those of plain iron at 1300 to 1500°F.

MACHINABILITY and OTHER PROPERTIES

NI-RESIST of normal hardness machines like 200 BHN gray iron and is readily weldable.

NI-RESIST has high specific electrical resistance. Thermal expansion can be controlled, from 60 per cent higher than that of plain iron to a low approximating that of Invar.

NI-RESIST is usually lower in cost than most other corrosion-resistant alloys. It is produced by authorized foundries only, in all industrial centers of the country. NI-RESIST castings have no more limitations in size and complexity than those of any gray iron.

APPLICATIONS

Several types of NI-RESIST *are available. All provide the fundamental properties described above, and differ only in certain special characteristics to meet a variety of industrial demands.*

Applications include: Salt filter drums, oil refinery tube supports and headers, turbine nozzle rings, cylinder liners, valves and fittings, furnace rollers, textile rolls, comminuter parts, blow pit pipes, precision machine tool spindle heads, bridge and work supports, magnet housings, sugar retorts, etc.

FULL INFORMATION

May we send you two booklets? One, entitled, "Engineering Properties and Applications of NI-RESIST," includes corrosion data on NI-RESIST and cast iron under 400 different corrosive conditions. The other, entitled, "Buyers' Guide for NI-RESIST Castings," lists producers of NI-RESIST castings. Both are yours for the asking. Write for them today.

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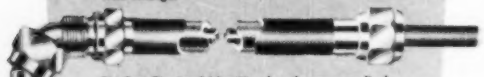
Titeflex Fleximold Conduit is light in weight, flexible, rugged, and absolutely tight. It is supplied in any desired lengths, complete with fittings.



Titeflex Fleximold Ignition Leads are supplied in complete assemblies (including rigid manifolds, leads and fittings); in sets of leads (comprising number and types of leads for a particular engine); and individually. Fleximold Leads are rewirable and detachable.

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SPECIALISTS IN AIRCRAFT, AUTOMOTIVE AND MARINE IGNITION SHIELDING

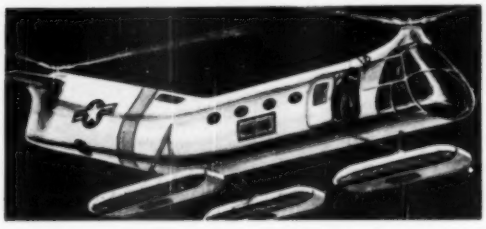
New DEVELOPMENTS

PRECIOUS METALS SALVAGED

More than $90,000 worth of platinum and rhodium have been salvaged from war-surplus ammunition plants. The metals, salvaged by the Army Ordnance Department, are in the form of dust within ammonia-oxidation units at five Ordnance works. The total collected to date is over 1,770 troy ounces. When properly refined, this quantity of metal is expected to break down into nearly 1,300 troy ounces of platinum, worth $69 an ounce, and about 41 ounces of rhodium, worth $120 an ounce.

ARCTIC RESCUE HELICOPTER

The H-21 arctic rescue helicopter, built by the Piasecki Helicopter Corporation, will be operated by the U.S.A.F.'s Air Rescue Service, a division of Military Air Transport (MATS). Featuring "omniphibious" landing gear, the H-21 will be able to land



The H-21 helicopter with "omniphibious" landing gear.

on snow, ice, water, tundra, marsh, or land without changing the gear which combines regular landing wheels, floats, and skis into a compact unit with any one usable at the will of the pilot.

The H-21 will be equipped with the Wright Cyclone R-1820-76A air-cooled radial engine. With a cabin 20 feet long by 5 feet, 6 inches wide and of the same height, and totaling 615 cubic feet, the H-21 provides the important advantages of the Piasecki-pioneered tandem configuration with its large center of gravity range, eliminating the usual loading and balancing problems.

"LITTLE DETROIT"

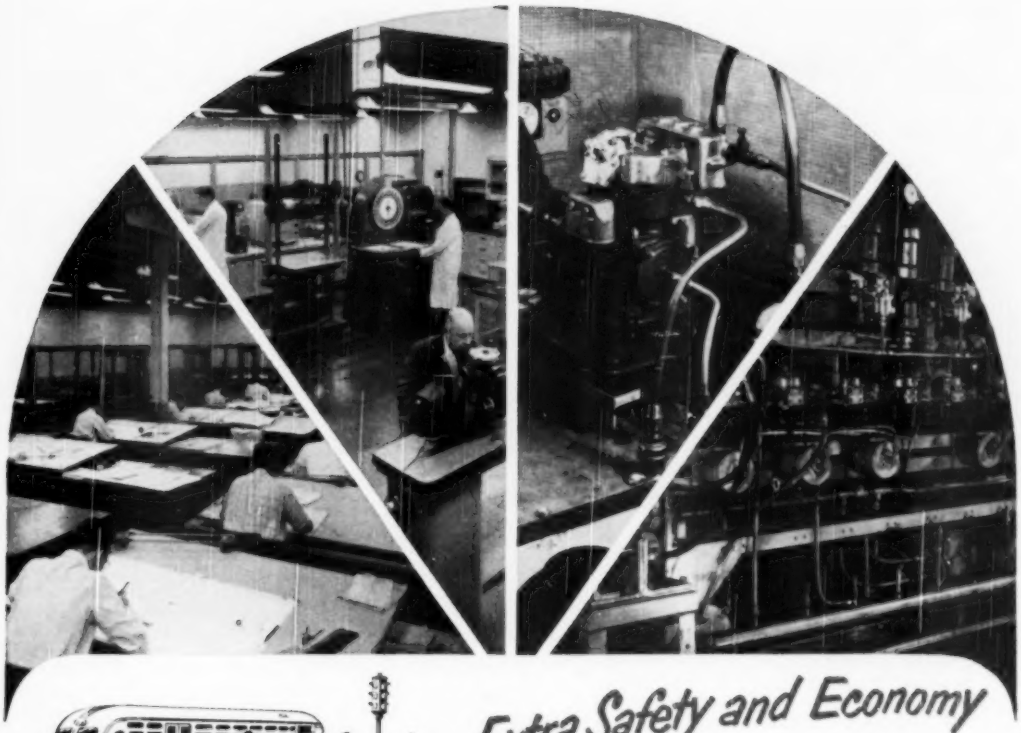
In what was once a Stuka divebomber plant in Wels, Austria, has been established the Wels U.S.F.A. Ordnance Center, a "little Detroit" that rebuilds every type of Army truck from the ground up, turning out vehicles in new condition and saving countless thousands of dollars by obviating new procurement.

Possibly the most impressive building in the establishment is the huge assembly shop located in a former hangar. Here mechanics on the assembly line start with a bare frame and end up with a fully reconditioned truck.

BETTER SNIPERSCOPE

Two recently revealed electrostatic generators of 6KV and 20KV are designed to replace cumbersome and shortlived batteries as a high-voltage supply for "snooperscopes," "sniperscopes," and similar infrared sighting equipment. The generators were designed by the Chatham Electronics Corporation in collaboration with U. S. Army Engineers. They are extremely compact, weigh only ten pounds, and are powered by a spring motor. Whereas the batteries which were formerly used lasted three hours, these units operate indefinitely.

(Continued on p. 366)



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Bendix-Westinghouse represents almost thirty years of experience in the development of automotive air brake equipment. The finest design, research and production talent working with the most modern laboratory controls and testing devices assure constant improvements in performance standards, *already the highest in the industry.* Every new coach design is completely analyzed from the ground up in order to tailor an air brake system exactly fitted to its load capacity and operating requirements. Be sure you get the benefit of this extra know-how and thoroughness—specify Bendix-Westinghouse Air Brakes.

THE BEST BRAKE IS AIR

BENDIX-WESTINGHOUSE AIR BRAKES

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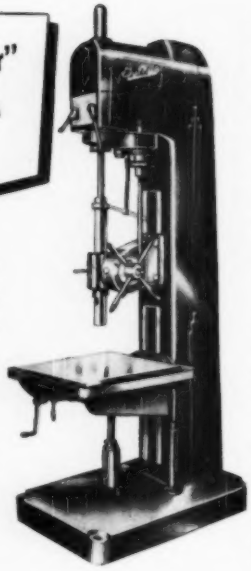
"Buffalo" "RPMster" The Drill With 100 Speeds



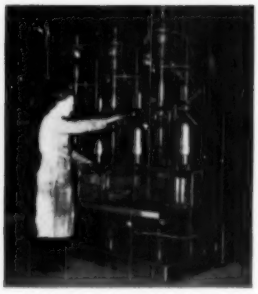
In "Buffalo" metalworking tools you'll find the convenient handling, the rigid accuracy and the rugged endurance so valuable in keeping costs down in any shop. For instance—

"Buffalo" "RPMster" The Drill Of 100 Speeds

Without shutting off motor, you can select the right drilling speed for the job at the touch of a lever on this popular "RPMster"! 99" high, 27" space under spindle nose. WRITE FOR BULLETIN 3257.

"Buffalo" No. 18 Drills

Handle up to 1" holes in cast iron. Available in 12 models to suit almost any requirement. 1 to 6 spindles, floor or bench types. WRITE FOR BULLETIN 3123-B.



"Buffalo" No. 22 Drills

Widely used in maintenance and production drilling up to 2" holes in cast iron. Easy handling, smooth action. Medium priced, high grade tools. BULLETIN 2989-F.

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BUFFALO FORGE COMPANY

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Kitchener, Ont.

New Developments

FIRE SUIT

Air Force technicians have developed the last word in wearing apparel for walking through the searing heat of gasoline flames to rescue trapped crewmen of crashed aircraft. Enabling personnel to work in 2,000-degree heat for 10 minutes, the suit is constructed of 18 layers of glass fiber, glass-fiber batt, glass-fiber net, neoprene-coated glass fiber, honeycombed cotton cloth, silver foil, aluminum foil, and nylon—all arranged so as to provide the best protection yet developed against plane-crash fires.

A NEW CRYSTAL

Barium titanate, a war-developed material with exceptional electrical behavior, may replace other crystals in submarine sound detection, and in other sound and ultrasonic equipment.

The sensitive atoms of barium titanate show a remarkably quick response to the slightest changes in pressure, temperature, or electrical field. Even light shining on a crystal of it will cause the atoms to rearrange themselves.

Ability to increase to an exceptionally high degree the electrical capacity of charged plates is one of barium titanate's important characteristics. This ability is known as the material's dielectric constant. Some estimates have placed the dielectric constant for barium titanate as high as 5,000, compared with about 7 for mica.

XF-91 INTERCEPTOR

The Air Force's XF-91, a high-altitude interceptor, recently completed its Phase One experimental flight tests at Edwards Air Force Base, Muroc, Calif. Unlike other current production or experimental fighter designs, the XF-91 has inverse taper on its sweptback wings, producing a wing which is wider at the tip than at the fuselage, and has a tandem-type landing gear. Another XF-91 feature is the variable incidence of the wing, permitting a high angle of attack for take-offs and landings and a thin, razor-like attack angle for high-speed flight. The XF-91 now utilizes the J-47 turbo-jet engine (5,200 pounds' thrust), plus afterburning, for its main power plant. At a later date four rocket motors are to be installed for use in obtaining rapid rate of climb to high altitudes and additional power in combat.

FIRE-RESISTANT PAINT

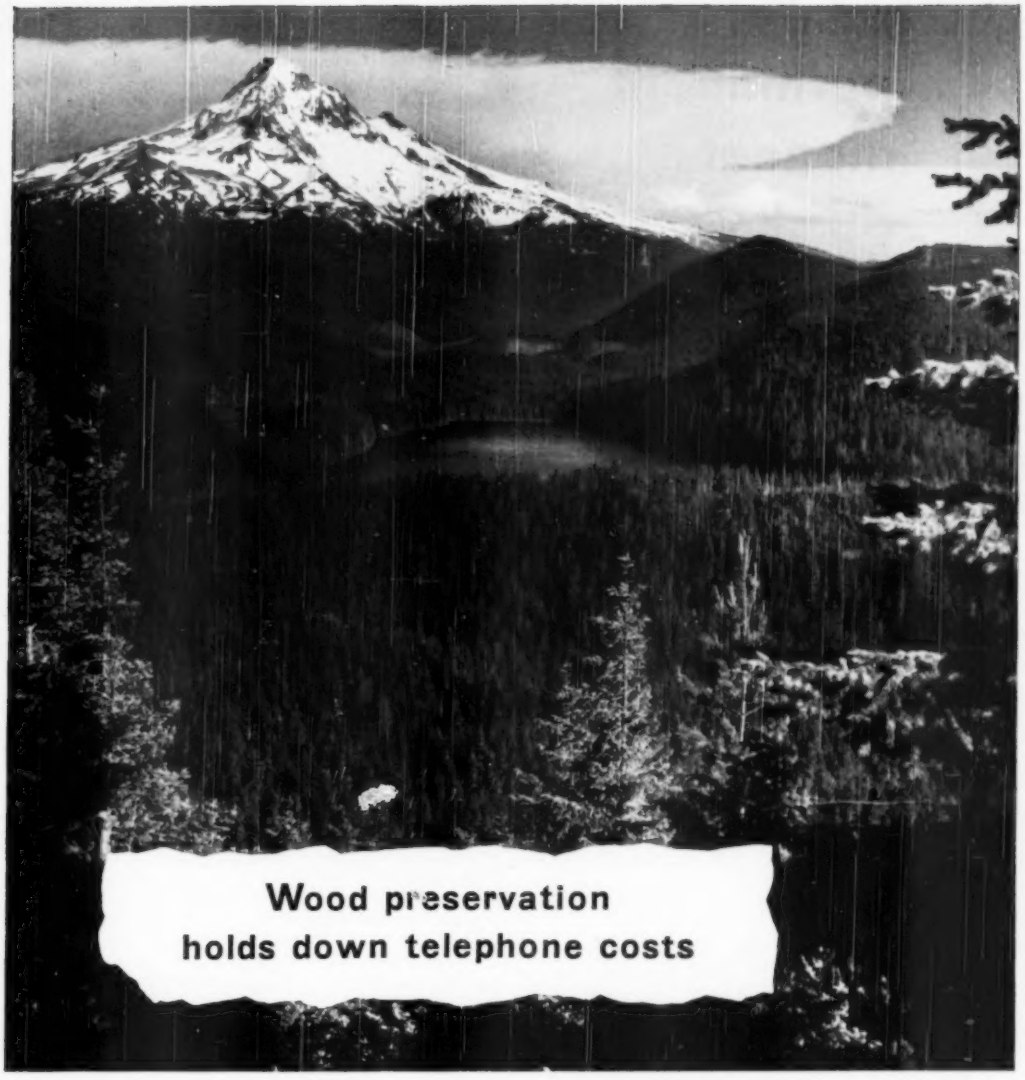
Paint can be made to retard fire instead of causing it to spread thanks to new chemical and paint research of the past few years. Widely used is a war development, a urea plastic-cellulose mixture, that creates a puffed-up coating under exposure to heat. The swelling of this glowproof coating creates air spaces that insulate the wood beneath from the heat that might make it burst into flame faster. Ammonium phosphate, also used to flameproof fabrics, stops the coating from burning, and finely divided carbon takes up flammable gases that are generated by heat in the wood beneath. Called commercially Albi-R, it also contains titanium pigments.

FLUSH-DECK CARRIER

The Navy is planning to continue with its flush-deck carrier project, although on a slightly smaller scale than the canceled 65,000-ton U.S.S. UNITED STATES. The Navy has been "beefing up" smaller-type carriers and has received tentative approval for the construction of a flush-deck carrier of from 52,000 to 55,000 tons. Naval experts say that the new carrier will probably be able to fulfill the functions of the larger type previously planned.

NEW MOLYBDENUM LUBRICANT

Molybdenum lubrication has now been made available in a form suitable for use in any conventional lubricating system by a new development of the Lockrey Company which is now placing on the market a new molybdenum-base lubricant. This can be used alone, or added directly to crank-case or other oils which



Poles are a substantial part of the plant that serves your telephone; making them last longer keeps down repairs and renewals that are part of telephone costs. So Bell Laboratories have long been active in the attack on wood-destroying fungi, the worst enemies of telephone poles.

Better, cleaner creosotes and other preservatives have been developed in co-operation with the wood-preserving industry. Research is now being carried out on greensalt—a new, clean, odorless preservative. Even the products of atomic energy research have been pressed into service—radioactive isotopes are used to measure penetration of fluids into wood.

Treated poles last from three to five times as long as untreated poles. This has saved enough timber during the last quarter century to equal a forest of 25,000,000 trees. More than that, wood preservation has enabled the use of cheaper, quickly growing timber instead of the scarcer varieties.

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carry it to the friction surfaces where it "plates out" on the metal, providing a permanent low-friction antiseizing coating. Actual tests have shown that friction surfaces running at high speed and under heavy pressure will heat up from 300 to 504 per cent faster with ordinary lubricating oil than when running dry with the new lubricant and moreover that the temperature rise with oil is continuous until failure and seizure, whereas with the new compound it reaches a stabilization point and then usually recedes.

JETS FOR TORPEDOES

The Navy has developed an underwater jet engine, using fuel that burns in water instead of air, for use in torpedoes or in anti-submarine devices. The waterborne jet works on much the same principle as the airborne ram jet. It consists of a roughly cylindrical chamber with openings at both ends. As the engine moves forward, water comes in the front opening and is mixed with a "water-reactive propellant." A "surface-tension depressant" (wetting agent) is injected into the water, too, presumably to help the fuel mix with the water stream or to help bubbles form. The combustion chamber is shaped so as to make the expanding water-and-gas mixture shoot out the rear opening as a high-speed jet, driving the torpedo forward.

NEW CARGO TRANSPORT

The Air Force now has a new production transport aircraft, the Douglas C-124 "Globemaster II." Designed to transport general cargo and heavy equipment such as tanks, field guns, bulldozers, and fully loaded trucks, the heavy-lift cargo aircraft, which evolved from the Douglas C-74 "Globemaster," has more than 10,000 usable cubic feet of cargo space and is expected to transport a load of approximately 50,000 pounds for a distance of 850 miles, unload, and return to its base without refueling.

RIDING A ROCKET

Air Force volunteers, riding in a rocket-propelled sled, are duplicating airplane crashes in an effort to provide greater flying safety. The experiments already have given information on just how much of the terrific decelerative force encountered in a crash the human body can safely withstand. In the Air Force experiments, volunteers ride the "human decelerator" sled which is guided by railway tracks and propelled by solid-fuel rockets into a series of mechanical brakes. The brakes decelerate the sled with a force equivalent to that experienced in actual crash landings.

The decelerator tests showed that when seated in a backward-facing position, with the back of the seat providing support, the human body could easily withstand a force of thirty-five "G's." In tests with forward-facing seats, it was necessary to provide the volunteers with a special seat harness consisting of web straps fastened across the lap, around each thigh, and over each shoulder to enable them to withstand the high "G" forces.

YF-86D INTERCEPTOR

The U. S. Air Force's latest model of the North American "Saber" jet fighter, the YF-86D, is designed to climb quickly to extreme altitudes for interception missions. It is powered by a General Electric J-47 jet engine equipped with an afterburner. The YF-86D differs from its record-breaking predecessor, the F-86A, by having its air intake duct under the nose instead of in the center of the nose, and it has a larger aft fuselage section to house its more powerful jet engine. Previous models are powered by a J-47 engine without the afterburner.

PRESSURIZED SPARK RANGE

An unconventional wind tunnel showing naval ordnance researchers how missiles will behave in free flight is located at the Naval Ordnance Laboratory, White Oak, Md. In a conventional tunnel, the model stands still while air flows around it. In this "pressurized spark range," the model is fired from a gun down a

This is no idle promise. It is a proved fact, demonstrated day after day in the production of widely varied parts and products. Three tons of N-A-X HIGH-TENSILE are yielding as many finished units as were previously yielded by *four* tons of carbon sheet steel.

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New Developments

steel tube. Twenty-five spark stations photograph its flight. The photos, both vertical and horizontal, give the exact location and angle of the missile at each station.

Pressures within the tube can be varied from as high as six atmospheres down to a virtual vacuum. Since increasing the pressure is the same as increasing the size of the missile, by firing a missile under a pressure of five atmospheres, Navy scientists can tell exactly how an identical model, five times larger, will behave at sea level. By changing pressures they can obtain information over an almost infinite range of missile sizes.

PENETRATION FIGHTER

The YF-93A—newest high-speed Air Force penetration fighter—has successfully completed its first flight tests at Muroc Dry Lake, Calif.

Although heavier than most jet fighters now in use, the YF-

Air Force

New penetration fighter is equipped with afterburner.

93A is designed to fly operationally at speeds close to the speed of sound. It is powered by a J-48 turbo-jet engine and gains extra thrust through the use of an afterburner. Air intake ducts are flush with each side of the plane's "Coke-bottle" fuselage near the nose.

NEW HELICOPTER TESTED

The Air Force has begun initial flight tests of its latest helicopter, the H-19, built by the Sikorsky Aircraft Division of the United Aircraft Corporation, Bridgeport, Conn. The new helicopter is specially designed for search, rescue, and liaison purposes. The aircraft has a crew of two and can carry ten passengers or eight litter patients and one attendant.

The top speed of the new helicopter is 100 miles an hour, with a cruising speed of 85 miles an hour. It has a service ceiling of 12,500 feet and can carry a useful load of 2,962 pounds.

CAPSULE COCKPIT

A breakaway cockpit unit, designed to serve as a parachute-borne emergency escape vehicle for pilots of high-altitude supersonic planes, has been developed by the Navy. The pod-shaped unit, known as an "ejection cockpit capsule," is completely enclosed and is pressurized and insulated. Riding in it, a pilot will be safely dropped from high altitudes where the rarified atmosphere and extreme cold can quickly destroy life. The cockpit capsule is blown from the plane when the pilot pulls a release lever. Three stabilizing tail fins prevent the capsule from tumbling through the air, and a large parachute drops it gently to the earth. In addition, the cockpit unit floats in water and will serve as a boat for pilots forced down at sea.

ARCTIC SURVIVAL HUT

A new 4-man quonset hut designed for use by stranded airmen in the arctic is made of cotton fabric, has no frame, and can be put up with a hand air pump. It is a development of the Air Force in conjunction with the U. S. Rubber Company. It is made of inch-thick, 2-layer cotton fabric coated with a low-temperature neoprene compound that will withstand extreme cold. The dead-air space between the two layers provides the insulation.

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Rebuilding Our Army

Our Strength Must Be as the Strength of Ten

Lightning Joe Collins is well known to the Ordnance fraternity. His picture on the front cover of this issue of ORDNANCE and his article which follows will remind readers and reassure them that the Army—and especially its modern weapons—are under capable military direction. General Collins, Chief of Staff of the United States Army, knows ordnance at first-hand: with the 1st Division in the First World War, with the 25th Division and the VII Corps in the Second World War. He knows and appreciates the strong bond that must exist between American industry and the Army to maintain peace in the atomic age.—THE EDITORS.

THE major tasks of the United States Army as it faces an acute defense prospect were set forth clearly and briefly by General Collins when he appeared before the Committee on Appropriations of the House of Representatives early this year. They are:

1. Retain forces in being prepared for immediate employment in case of an emergency.

2. Fulfill the tremendous occupation task which requires continued deployment overseas of a large portion of the Army's strength.

3. Maintain forces for the defense of vital installations within our own country, such as atomic-energy installations and key industrial centers.

4. Provide a mobilization base for expansion of the Army in case of war.

5. Strengthen the Reserve components by providing them with better equipment, facilities, and training.

6. Perform impartial rôles in other fields, such as a reasonable rearmament of Atlantic Pact countries and the provision of military advisory groups and military missions.

7. Provide for intensive research and development and for industrial mobilization.

8. Maintain a military education system which will keep alive and up to date the professional knowledge of our fighting men.

These tasks individually present many problems of both a military and an economic nature. Collectively they constitute a national responsibility which, when added to the naval and air missions of our armed forces, calls for action on the part of all our people.

D-DAY AT PORTREX *found troops of the 3rd Infantry Division boarding a transport prior to the "invasion" of Vieques, Puerto Rico, in the combined Army, Navy, Air Force exercises held in March (Department of Defense photo).*

Great Responsibilities

The American Ordnance Association is fully cognizant of its responsibilities under the stresses of the current situation. It is especially concerned about the degree of readiness on the part of the Government, on the one hand, and of science and industry on the other, to meet the challenge which present world conditions offer. In neither case can the attitude be one of complacency. The responsibility is very great.

Of the duties enumerated above by the Army Chief of Staff, that category relating to intensive research and development and industrial mobilization is most urgent, for in these rests the most far-reaching elements of our strength. Our country cannot hope to match in men under arms the military power of certain other countries. But we can and must make up for that deficiency in the magnitude and vision of our weapons research and development and above all in our readiness to put our vast industrial power to instant use whenever we are attacked.

Hence, no matter what reductions may be forthcoming in the required efforts to lessen the cost of our military establishment, the two elements which we will be wise to keep at maximum efficiency are weapons research and industrial strength. The former will be the province of our renowned scientific and engineering personnel throughout the land. The latter will always be the responsibility of our free enterprise as expressed in industrial power unequaled anywhere in the world.

Keep Industry Strong

That industrial power must be kept strong. It must be protected against weakening influences at home and abroad. Already it is under terrific burdens of taxation, of restraint, of foreign competition, and at times of demogogic misrepresentation. Here we come face to face with weakened morale among many segments of our people while knowing full well that the moral is to the material as three is to one.

Any potential enemy of the United States knows that its only chance of defeating us is first to cripple or destroy our industrial capacity. Since this country has no munitions industry, without our civilian plants and factories we could not defend ourselves.

As a people we could do no wiser thing in trying to uphold the hands of our military leaders than by taking instant and aggressive steps to emphasize research and industrial strength. These, fortified by morale, are the keystone of the arch upon which our national defense rests. And our strength must be as of the strength of ten.

Our Army Looks To Its Ordnance

A Program of Reëquipment Is Now Under Way

by

Gen. J. Lawton Collins

Chief of Staff, United States Army

In this timely article the distinguished Chief of Staff of the Army describes the steps that are being taken to modernize our weapons, especially tanks, antiaircraft artillery, and fire control

FIVE years ago we wrecked the greatest military machine—the finest Army, Navy, and Air Force—the world had ever seen. In our usual optimistic fashion we Americans had decided that there were going to be no more wars. We had already fought two great wars in order to insure peace, and we now thought there was no chance of another war. As a result, we wrecked this great machine.

Not only did we demobilize our armed forces but as members of American industry we also demobilized the greatest industrial organization the world had ever seen. Many of the great factories of this country—normally employed in the pursuits of peace but which had been manufacturing tanks, airplanes, and machine guns—put away their jigs, dies, and fixtures and went back to their peaceful pursuits, hoping, along with all of us, that the rest of the world would do likewise.

But, unfortunately, this has not been the case. While we here in this country were laying aside the tools of war and the machines that produced those tools, behind the "Iron Curtain" in Europe another great menace to the peace of the world was growing. We are all familiar with the pattern that it followed—the gradual overrunning of the same countries that Hitler overran; the grinding down of the free will of these peoples; the establishment of the same type of slave labor that had existed under the Nazis and which I have seen with my own eyes. All that was carried out and is still being carried out, and we all share a certain responsibility for it. I am certain that had we not wrecked our great military power and had it been possible for us to have arranged the real conditions of peace before we laid aside our arms, the world would not be in its present condition.

Mistake Realized

Our people finally realized that a mistake had been made. Three or four years ago we began to take steps to check the spread of this ghastly thing—Communism—which is just as bad as Naziism ever was, and we began the program of economic aid to Europe. With the signing of the North Atlantic Pact we joined, for the first time during peace, an international alliance. Recently the Congress passed the Military Aid Program under which we will shortly be sending to our friends of the Western World some slight token of arms.

An integral part of our over-all program was the initiation of a rebuilding of our forces—Army, Navy, and Air Force—and while the progress has been slow, I do want to report that it has been substantial. So far as the Army is concerned, I will reiterate a statement that I made recently: The Army is in better shape today than it was three years ago.

We in the Army have a great responsibility because we are, to a great extent, the representatives of the American people in the occupied territories of the world. We still have one division and three very fine constabulary regiments in Europe. Until recently the Army had to carry the load in the occupation job over there. Together with the Air Force and the Navy, we were able to win the peacetime battle of Berlin. The Army and the Air Force are still in Europe, and we plan to stay there until some genuine basis for lasting peace is established.

In Japan, which I visited recently, we still have four divisions, and they, likewise, are getting back on their feet again. I visited Okinawa on a recent trip with the Joint Chiefs of Staff and I can assure you that, although the housing conditions there are still bad, the morale of our regimental combat team is going up. Now that Congress has made appropriations for housing in Okinawa, I am sure conditions there will be greatly improved within the next year.

Here at home, as far as the Army is concerned, we have five divisions in the Regular service. We have an Airborne division at Fort Bragg, N. C., and another at Fort Campbell, Ky. We have an Infantry division on the West Coast at Fort Lewis, Wash., and we have another at Fort Benning, Ga. At Camp Hood, Tex., we have recreated one of the great armored divisions that we had during the war.

These five divisions in the Regular service are on the upswing. And so I say, as far as the Army is concerned, we are in better shape today than we were three years ago.

Unfortunately, both in and out of the service, we have thought entirely too much about the question of mere numbers of men and have, to some extent, forgotten that man power alone is not responsible for victory in war or for preparedness in peace. If there is anything today that would give pause to a potential enemy who might be considering world domination it would be less the growing strength of our armed forces than it would the great industrial potential of this country. Our ultimate reserve is our great industrial potential.

But it takes time to organize that po-

tential even in peacetime, and in the event of war it would require a matter of eighteen months before industry could be properly geared to take up where we left off five years ago.

In the Army we are turning our attention more and more to the reëquipping of our forces. In doing this we are concentrating our efforts in three or four fields. For example, our tanks are outmoded in comparison with those of certain other nations and must be replaced. Recently, however, we have developed a light tank which, I am confident, is as fine or finer than those possessed by other countries of the world.

I stopped at the Detroit Arsenal a few months ago on my way back from Japan and there I not only saw the prototype of this light tank but also the modifications that are going on in the modernization of the World War II type tanks—the Pershing and the General Patton. Both of these would give excellent accounts of themselves. It is still true, however, that it will be some time before we have a series of tanks that will be comparable to those of, for example, Russia.

The tank, of course, is only one of the elements that might be involved in a tank battle. The "bazooka" was developed during the war. It can be fired from the shoulder by one man with another man to load it. The ammunition is fairly expensive, but the bazooka is cheap, and the combination of the two gives us a very inexpensive and highly mobile weapon. We are definitely working on the further development of the bazooka as an integral part of our antitank program.

Recoilless Weapons

We also developed recoilless weapons toward the end of the war. These weapons, although inexpensive, can shoot fairly large caliber ammunition. They, too, are an important factor in our antitank program.

It is the ammunition that counts most, and it is here that the members of the American Ordnance Association are playing a very important part, along with our great Ordnance Department, in the development of proper ammunition for our weapons. These weapons can and will knock out any tank in the world and cost much less than an equally effective tank. All this serves to indicate that the tank and antitank program is making genuine progress.

Antiaircraft Defense

The next field of development is antiaircraft defense. Certainly one of the things with which we must immediately concern ourselves is the defense of the industrial areas in this country. The airplane has made a marked difference in warfare. No longer can we count solely on the vast bodies of water that separate us from Europe and Asia. The airplane can span the seas. Our industries, particularly in certain areas, are easily within striking distance of modern aircraft in the hands of potential enemies. The protection of our cities from possible air attack is something that is giving all of us concern—particularly now that we no longer have a monopoly in the field of atomic energy.

"The members of the American Ordnance Association are playing a very important part, along with our great Ordnance Department, in the development of proper ammunition for our weapons."

We are bound to be on the receiving end in the early days of a possible future war. We will never initiate one ourselves, and because we cannot definitely prevent one if the other party wants to aggress we must give thought to the constant readiness of the defenses of our country.

This involves, from a defense viewpoint, the setting up of proper radar screens and the development of proper interceptor aircraft and antiaircraft weapons. Because the AA artillery with which we ended the war was designed to conquer aircraft of World War II types, which are far inferior to modern jet-propelled aircraft, it has been necessary for us, in the last year or two, to work extremely hard in the development of new types of antiaircraft weapons that can detect the high-speed, high-flying airplane, track it, and shoot it down.

I recently visited our Antiaircraft and Guided Missile Center at Fort Bliss, Tex., and the guided-missile range at White Sands, N. Mex. I saw there some of our new developments which have great promise. They will afford us a higher degree of security from the antiaircraft standpoint than do present weapons. The new weapons that pick up a target by radar, track it by radar, take the proper lead, and then fire the guns—whether the operating crews ever see the plane or not—are great advancements. They are still to some extent, however, in the process of development.

This year, for the first time, we have sufficient funds to buy a few units of the "Skysweeper"—one of the new antiaircraft weapons that will track planes flying at the speed of sound. These are still, however, also under development. Along with them is a series of guided missiles being developed by the Army, Navy, and Air Force in conjunction with civilian scientists in many of the great industrial plants and in a number of the fine technical schools and laboratories of the country.

Science and Industry

The relationship that we have with these scientists and industrial leaders is of the very highest order. We have made an important change since prewar days. We used to turn to the manufacturing companies and tell them the detailed specifications for a weapon that we wanted to have produced. By being so explicit in our directions we unquestionably hampered the development of many of these new weapons.

We now proceed differently. We simply state that we want a gun or weapon to accomplish a certain purpose—to meet the requirements of speed and height, etc. Then we give them the broadest possible leeway in the development of the weapon itself. This change in policy has been a great advance in our relationship with science and industry and adds much to the originality of our new weapons.

The next field in which I am deeply interested is the development of our airborne program. I am confident that in the event of another war the airplane will play an even more important part than it did in the last and that the movement of troops by air will play an essential part in the defense of the United States.

We still have many problems to solve, however. The limitations and size of aircraft along with the size of landing strips on which they must land are well known. Although we might be able to transport a number of men across the ocean, drop them by parachute, or land them on captured airfields, we would still have the problem of supplying those men with food, ammunition, gasoline, bombs, and heavy weapons, including tanks.

Air Transport

The airplane will not replace the ship as the great transporter of the bulk of supplies in the foreseeable future. It is essential, therefore, that our Navy remain strong in order that we may keep the sea lanes open and fight the submarine menace, which is an increasing threat to our sea communications. But we must not lose sight of the fact that we can move great quantities of supplies by air, and within our economic capacity we must develop some satisfactory solution to the problem of moving troops and heavy equipment by this method.

We have made considerable progress in the design of aircraft for this purpose. Not long ago, at Fort Bragg, N. C., one of our great divisions, the 82nd Airborne, put on a demonstration for the President of the United States and a distinguished group of civilian visitors. There I saw for the first time an entire battery of 105-mm. field artillery dropped by parachute. These heavy field-artillery guns were dropped as complete units with two large parachutes attached to each gun. The jeeps, which are used to tow the guns, were likewise dropped intact and mounted on a platform. As this equipment was landed, ammunition was also dropped. Finally, other planes dropped the officers and men. Twelve minutes later the entire battery was in firing position and actually firing ammunition dropped from the air.

These are all great advances, but there is much yet that we don't know about the movement of troops by air: the complexities of supply, staff coördination, planning the movement of the aircraft at night, landing the pathfinders in the darkness, and setting up radar beams by which these planes can come in at the proper moment. All this takes great skill, and there is still much that we have to learn about these matters.

"The modern soldier, like his counterparts in the Navy and the Air Force, is more dependent than ever before upon the complex machines of modern war. For the combat soldier of today no longer marches into battle—instead he enters the battlefield by truck, from planes, or aboard a tank.

"And when he performs his historic rôle of meeting the enemy face to face, he must have the tremendous mobility and firepower that modern war demands and which intricate scientific and technical devices alone can provide. Within the Infantry division, for example, he has at his disposal more than 20,000 weapons of all types, more than 2,000 radios, and more than 4,000 vehicles.

"The Army's research and development program is designed to meet the ever-increasing need of the combat soldier for new and improved weapons. It is an expensive process, but the results obtained in the past war testify eloquently to the soundness of the investment.

"We are completing the development of extremely accurate fire-control systems for detecting and engaging high-altitude targets traveling at near-sonic speeds for use with our long-range antiaircraft guns. We have also developed the new Skysweeper, a fully automatic, high-velocity, radar-directed gun for combating aircraft at lower altitudes. And the progress we are making in other fields is equally encouraging." — *General Collins before the U. S. House of Representatives Defense Appropriations Subcommittee, January 1950.*

The main problem, however, is in getting men up front to fight. No matter what you do with the machines, you still have the problem of how to handle the troops who control these complex machines. How do you train them to instill a willingness to close with an enemy that they may have to land upon in darkness, as in the case of the paratroopers? That is still one of the great problems of the Army, as it is, of course, with all the other services.

This preparation for national security costs money—lots of it. Much has been seen in the press as to whether we are spending enough or not enough, whether the sum available is properly divided between the Army, Navy, and the Air Force, and whether it is wisely spent. I can assure you that I and my colleagues on the Joint Chiefs of Staff weigh this problem, under the leadership of the Secretary of Defense and our President, with the utmost sincerity and devotion and with as equitable and broad a point of view as we possibly can. I am confident that we are making progress in effecting a balance between forces. This, we feel, is essential.

What About the Cost?

How much money should be spent? We military men must always keep in mind the fact that the real strength of this country is its economic well-being: its great industrial plants, its farms, and its labor. If, year after year, we were to demand funds to guarantee the complete defense of this country, we could eventually wreck our national economy. What we are faced with, then, is the problem of maintaining a delicate balance between the many essential factors of our security—between our economic well-being, our military forces, and between men and machines.

This means that we must take chances on certain factors. But I can assure the taxpayers of our country that their funds are neither asked for idly nor spent idly and that we in the military are exercising the utmost economy in the interest of providing maximum security at minimum costs.

The National Debt and National Defense

The Weakness of Our Present Short-Term Fiscal Policies

by

Lewis H. Brown

Our industrial strength requires a sound monetary and banking system in peace and in war. Should we procrastinate in adopting the proper program, our industrial machine may not be able to win another great conflict, if and when it comes.

I WOULD like to consider the problem of debt management as a mere everyday businessman who has tried all his life to prevent unimportant details from hiding the core of a problem. I would like to discuss especially the relationship of the national debt to preparedness.

In the First World War I served as an officer in France. In the Second World War I served as adviser to the Chief of Ordnance in helping to administer a program that spent forty-five billion dollars on guns, ammunition, bombs, tanks, motorized equipment, and other fighting weapons. As a result, I believe I can speak with some measure of authority as to what is necessary to win a war.

In the fall of 1930 I was in Germany where Johns-Manville Corporation had a small subsidiary. I went over there to study the possibility of expanding its operations. My conclusions were that National Socialism was spreading like a prairie fire, that Hitler would come to power, and that instead of expanding we should close our operations in Germany and in all of Europe and get our capital out. It was no place for private enterprise.

Private enterprise cannot compete with the state. Socialism is only a twilight zone between the sunshine of freedom and the darkness of some form of slavery. Socialism moves to nationalization of industry and then inevitably onward to the totalitarian state.

In a talk I gave in London on December 9, 1930, I predicted that Hitler would come to power and that unless England and France moved in then to arrest him, there would be another world war. I would now like to express the opinion that we will probably be

compelled to fight World War III to preserve a world in which freedom may survive and to stop the spread of Communism and the expanding totalitarian state. This is a possibility that none of us likes to contemplate, yet we dare not ignore it, and we ought to plan to survive it.

The basic means which enabled us to win World Wars I and II was the efficiency of our industrial machine and its matchless productivity under free enterprise. I know what made that industrial machine produce. Trained industrial leaders in the War Production Board provided a free-wheeling clutch between the totalitarian state of war and the free-enterprise system. In Ordnance, a board of advisers translated the orders of total war into the incentives of free enterprise.

But free enterprise cannot function without a sound monetary and banking system. In the Second World War we had a sound system, and it served its purpose.

Under a greater Secretary of the Treasury with greater vision, understanding, and courage, it is my opinion that we could have increased taxes more—and sooner—and thus ended the war with a smaller burden of public debt.

Proper Funding

But of even greater importance, we could have largely funded that debt over fifty years or more, while patriotism ran high. Such a funded debt, like that of Great Britain after the Napoleonic wars, could have been more easily paid by future generations through the increased productivity of the country.

Instead, through a short-sighted policy of overemphasis on a low interest rate, we find ourselves with an enormous public debt not properly funded. The maturity of this public debt of the United States is short and is getting shorter as time passes. Year after year, in spite of low interest rates and easy money, the Treasury passes by many opportunities to fund and refund it.

The shortest debt approximates an interest-bearing demand deposit with the United States Government. All the savings bonds are payable on demand, though subject to a penalty in case payment is demanded before maturity. In spite of a Federal Reserve statement last June that the general welfare was to be

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preferred to a fixed pattern of interest rates, the policy of par-pegging the long bonds has never been abandoned clearly and unequivocally so that the people at large can understand it. In consequence, even the long bonds are regarded by many as payable on demand at par or better.

The shorter the maturity of the debt the less freedom the Treasury and the Federal Reserve have to govern fiscal and monetary policies in the interest of the general welfare. The necessity of incessantly meeting great maturities imposes upon the fiscal and monetary authorities such restriction in regard to credit-control policies as is highly disadvantageous to the country at large.

As long as it is necessary for the Reserve banks to provide funds to absorb large amounts of discount bills and Treasury certificates, the market for these obligations cannot be said to be realistic.

The effect upon the budget of an increased level of interest rates is an important consideration. But a moderate increase in interest charges would involve an inconsiderable burden compared with the benefit which would result from the greater freedom of action which the Treasury and the Federal Reserve would have in the future in meeting the exigencies of the requirements of the state. Such an increase could result from lengthening the maturity of some part of the public debt at this time when a low level of interest rates prevails.

Following World War I the Treasury began its refunding principally with 7-year obligations. Today there are relatively small amounts of Government issues maturing ahead in the late 1950's.

No one suggests refunding the whole debt or converting all the bills, certificates, notes, savings bonds, and other short-dated bonds into bonds of remote maturity. Only a moderate amount of bonds of longer maturity need be issued from time to time in small installments to meet maturities in order to establish the principle and practice of lengthening out the maturity of the public debt a little, instead of letting it grow shorter and shorter as time passes.

This need not involve any great increase in over-all interest charges. What increase may be involved should be fully compensated by the greater freedom of the Treasury and Federal Reserve to deal wisely with credit policy.

"Free enterprise cannot function without a sound monetary system. In the Second World War we had a sound system, and it served its purpose. Under a greater Secretary of the Treasury with greater vision, understanding, and courage, it is my opinion that we could have increased taxes more—and sooner—and thus ended the war with a smaller burden of public debt.

"But of even greater importance, we could have largely funded that debt over fifty years or more, while patriotism ran high. Such a funded debt, like that of Great Britain after the Napoleonic wars, could have been more easily paid by future generations through the increased productivity of the country."

As one considers the history of public finance in the First and Second World Wars, one is aware that the success of war finance on each occasion was in no small part due to two basic factors. First, the amount of the public debt was relatively small when war started, as compared with the volume of the war's requirements. Secondly, when each war started the public debt was well funded on the whole, and the short-dated debt was inconsiderable relative to war requirements.

Though every one hopes that there will not be a third world war, no one can feel sure there won't be. It seems very imprudent to face the risks of war, not to mention the current deficit financing, with an ever-increasing short-dated debt.

From the point of view of common prudence and the welfare of the general economy, it is of extraordinary importance that the Treasury should sell from time to time in moderate amounts long bonds of the United States calculated to attract investment money and gradually to reduce the volume of the short-dated debt and dependence on bank money.

Quite aside from the matter of the maturity of the public debt, the general level of interest rates established and maintained by artificial support of the Government bond and security market seems to be too low to maintain a balanced economy and to encourage thrift, savings, and investment.

Summary

To summarize the points outlined above:

1. We must face up to the real possibility of World War III.

2. We are not prepared for it.

3. We cannot win it without an efficient industrial machine. The efficiency of our machine is being threatened by the onward march of socialism right here in the U.S.A.—*now*.

4. Our industrial machine cannot function without a sound monetary and banking system.

5. Our banking and monetary system is not sound today because we have failed to fund our enormous public debt and because we have pursued a short-sighted policy of putting low interest rates ahead of proper funding.

6. It is late, but perhaps not too late, to establish a sound policy that is necessary to a sound system.

7. If we wait until it is too late we will so cripple our industrial machine that we will be unable to win World War III if and when it comes.

8. The men who are or may be responsible for such a result will not be honored in the pages of history nor by the American people now or by future generations.

As for myself, I intend to put this statement in a safe place so that at least my children and grandchildren will know that while I did what I could to help win World Wars I and II, I have also done what I could to try to prevent our losing World War III.

Tomorrow's Amphibious Artillery

Heavy Weapons Must Accompany the Infantry in Future Assaults

by

Maj. E. J. Rowse

Self-propelled weapons with splinterproof coverings would be basic factors in facilitating landing operations on enemy shores

ONE of the weaknesses, if not *the* weakness, of past amphibious operations was the lack of organic supporting fires for the landing force during the most critical phase of those operations—the beach assault. While it is true that carrier aircraft and naval gunfire furnished very effective support for the Pacific campaigns, it is also true that the assault infantryman, to all intents and purposes, fought essentially alone from H-hour until H-hour plus one or two hours. And he fought alone until organic close-fire units and air and naval gunfire control agencies were built up and established ashore.

During the Second World War the general landing area for a planned amphibious operation was subjected to intense destruction and neutralization bombardment by air and naval gunfire for a period of days, weeks, or months. This was always consistent with the means available and the need for secrecy or surprise. The approach from the line of departure to the landing beaches of the assault waves was covered by heavy and relatively continuous pre-H-hour air and naval gunfire which was lifted inland as the assault waves touched down on the beach in accordance with a rather flexible time schedule.

LVT(A)'s (armored tracked landing vehicles) which normally preceded the leading waves of the assault infantrymen to the beach also provided effective fire support during this period by engaging enemy antiboat weapons and other such targets which could seriously hamper or restrict the movement to the landing beaches. During the actual landing, LVT(A)'s covered the deployment of the assault infantrymen by neutralizing or destroying beach-line weapons located along the landing beaches.

Air and naval gunfire maintained post-H-hour scheduled fires on key enemy terrain features, suspected enemy positions, and on critical avenues of approach for counterattacking forces.

At the same time, air and naval support elements were prepared to take under immediate fire those enemy targets of opportunity which had been located by aerial observers or by the pilots themselves. These first had to be positively identified as enemy targets.

No Close-Fire Support

Such methods were sufficient to get the assault elements ashore, but the weakness lies in their inability to provide adequate organic close-fire support for the landing force subsequent to this critical time. This should be done to

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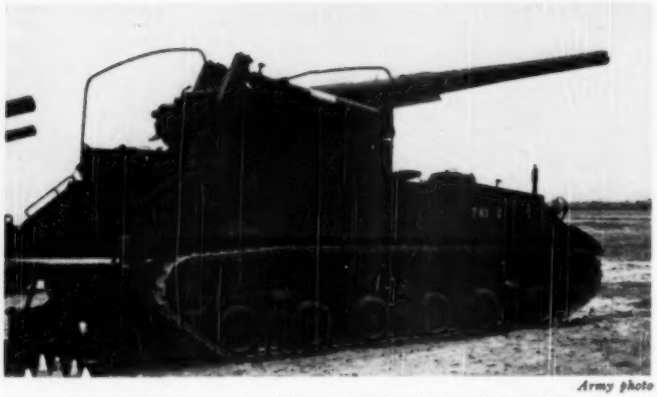
This article represents the personal views of the author and is not necessarily official Marine Corps policy or doctrine.



Army photo

Assault artillery up to the 155-mm. gun should be made amphibious.

insure that the assault infantry would be capable of advancing rapidly beyond the first cover of the foreshore. LVT(A)'s were not capable of furnishing this support due mainly to their bulkiness, lack of maneuverability, and their vulnerability to small arms, antitank mines, and other obstacles.

Air and naval gunfire-control personnel were provided to control the fires of their respective arms and to establish liaison with the supported assault elements. They were usually unable to find positions from which they could actually regulate the fires of their supporting weapons or which would provide minimum cover for personnel and bulky communications equipment.

Another pertinent point concerning the air and naval gunfire liaison parties is the extreme difficulty they experienced in successfully landing and setting up their communications equipment during this phase of the operation. Forward artillery observers and liaison parties were normally landed with the assault elements, but the artillery weapons could not be landed until sufficient area ashore had been uncovered for artillery positions.

Tanks Vulnerable

Tanks were usually not landed early enough to be of aid at this point because of their vulnerability during the ship-to-shore movement. This was caused by the large and comparatively slow tank landing craft and the lack of maneuver space in the beach area.

Thus it is apparent that the beach assault, covering the period from H-hour to H-hour plus one or two hours, was essentially an infantry action. This held true throughout most of the Pacific amphibious operations. The need in the future is a combined-arms beach assault. This will include not only all the desirable features of the past but also infantry, tank, and field-artillery units sufficient in strength and so equipped as to insure an assault that will carry attacking forces well beyond the immediate landing beaches. Such an assault could be provided with close and continuous support from all arms during the immediate post-H-hour phase.

This new concept of future amphibious operations envisages a tank-led or tank-supported amphibious assault which would provide sufficient shock action to enable infantry elements to follow rapidly or lead the tanks across the landing beaches. They would then proceed over the foreshore and well into the landing area of the objective. This, in itself, would provide the necessary positions for an early landing of assault artillery to add support to the continuing attack. Such action would insure sufficient protection and elbow room for air and naval gunfire control parties to establish themselves effectively ashore.

In order to execute the tactics involved in this proposed concept of future amphibious operations, there is a definite need for improvement in present equipment or for the development of new equipment. Tanks can be landed early in amphibious operations and have been so landed through use of tank-flotation devices. The primary objection to present tank-flotation gear is the fact that it is too large, too bulky, and too slow when water-borne.

Observation Vehicles

Forward artillery observers, liaison parties, and the air and naval gunfire control parties could be landed efficiently in lightly armored observation vehicles equipped with an improved flotation device. LVT's (landing vehicles, tracked), modified to include overhead splinterproof protection could also be used. The requirement for amphibious assault artillery includes either: (1) An LVT(A)-type weapon available in light (105-mm. howitzer) and medium (155-mm. howitzer) calibers, or (2) a lightly armored, self-propelled artillery weapon provided with splinterproof overhead cover for the gun crews. This could be equipped with an acceptable flotation device (for light and medium artillery) and a gyrostabilizer (for light artillery only) for the ship-to-shore movement.

Marine Corps field artillery, the Marine division's most powerful organic supporting arm, was unable to participate in the most critical phase of amphibious operations—the beach assault. This was primarily due to the inherent vulnerability of the field-artillery arm and to the artillery's requirement for positions from which it could effectively support the infantry or armor.

Consider this question of vulnerability. Present-day Marine Corps field-artillery weapons are comparatively bulky. They are unarmored, difficult to emplace, and are vulnerable to enemy artillery and to mechanized and air attacks during movement or during the occupation of positions. This vulnerability during movement is particularly true in the ship-to-shore phase of amphibious operations.

Normally, artillery was not landed until tentative positions were relatively free from aimed enemy small-arms fire or from mortar fire. It was therefore physically impossible for artillery to participate in or to support the beach assault in amphibious landings, unless off-

shore islands were available within range of the landing beaches. This latter situation did not exist in the majority of the Pacific campaigns.

Dispersion Important

Consider the problem of position areas. A field-artillery battalion requires at least 120,000 square yards of terrain to provide for the minimum desired dispersion of weapons, ammunition, personnel, and command-post and fire-direction installations. Dispersion, which is one means of reducing artillery's vulnerability, cannot be overemphasized, since it will be equally as important in the future as it has been in the past. This is most important in the nullification of the effects of massed concentrations of VT-fuzed projectiles or atomic missiles.

Such areas cannot be found on the landing beaches proper due to the restricted size of the beaches. It is even more important to keep the beaches clear of all unnecessary personnel and equipment, thus insuring the uninterrupted flow of reserves and supplies over those beaches. This means, then, that artillery cannot be landed until the front lines extend some 500 to 1,000 yards inland.

This problem of providing artillery support for the beach assault resolves itself primarily into one of reducing artillery's vulnerability and, at the same time, increasing the speed with which artillery positions can be made tenable for occupancy.

The vulnerability of field-artillery weapons can be appreciably reduced by providing lightly armored, self-propelled weapons with splinterproof overhead cover for the crews. The vulnerability of field-artillery control agencies can be reduced by providing artillery observers, liaison personnel, and certain key command personnel with armored or splinterproof observation vehicles.

This requirement for artillery weapons need not make them medium or heavy tanks, but the armor should be sufficient to protect the weapons and their personnel from the fragments resulting from air bursts or VT-fuzed projectiles. We will accept the chance of a direct hit on a weapon because the probabilities of such a hit are slight. We cannot, however, allow our weapons, and thus our supporting fires, to be neutralized when under enemy fire due to the threat of casualties from fragments and splinters.

Splinterproof Weapons

Our objective is not armored weapons but rather splinterproof weapons that will enable crews to service the pieces continuously under all types of enemy fire. These self-propelled weapons must be designed to be equipped with flotation devices to preclude the necessity for special landing craft to transport the artillery ashore. This would not only reduce the vulnerability during the conduct of land operations, but during the ship-to-shore movement as well.

One of the major problems involved in planning for amphibious operations is to effect a balance between the landing force's shipping requirements and the amount of available shipping. In the past, for example, Marine Corps field-artillery units were never able to take their full allowance of motor transport with them in the assault shipping due to the lack of available space.

Thus present matériel is not completely satisfactory for amphibious operations primarily because modern self-propelled artillery is too heavy. For example, the towed 105-mm. howitzer weighs in the neighborhood of 5,000 pounds as opposed to the 39,000 pounds of the 105-mm. self-propelled weapon.

These figures are not, however, as disproportionate as they may appear, for it must be remembered that the towed weapon requires a prime mover which weighs some 14,000 pounds. As a result, the actual difference in total weights between the towed weapon, its prime mover, and the self-propelled piece is about 20,000 pounds. This difference is still too great, and it must be reduced for amphibious assault artillery requirements.

The amphibious artillery weapon of the future should include the following characteristics: (1) It should be self-propelled; (2) It should be light in weight and small in size; (3) It should be lightly armored to include overhead protection for gun crews; (4) The chassis of the self-propelled weapon in light and medium calibers should be seaworthy; (5) It should have sufficient ammunition storage capacity; (6) Self-propelled light artillery should be equipped with gyrostabilizers.

Observation Needed

If it is assumed that the incorporation of these design features will give us an artillery piece which will be satisfactory for future amphibious operations, does it follow that these weapons alone will allow field artillery effectively to participate in and support the beach assault of the future? It does not. Having the proper weapons ashore does not necessarily guarantee that they will be fired against anything but direct-fire targets at close range by individual gun crews.

This is not the proper mission of

Self-propelled weapons should have splinterproof crew protection.

field artillery. The field-artillery arm must have observation over the enemy-held terrain in order to execute its normal missions in combat. This should include interior and exterior communications and a fire-direction agency. Observers locate enemy targets, request and adjust artillery fires thereon, and report results of all firing. The fire-direction center then receives requests, computes the necessary firing data for the weapons so that the enemy targets can be engaged, and controls all firing.

Wire or radio communication provides the necessary link between observers and the fire-direction center, between the fire-direction center and the guns, and between the supported unit (infantry or armor) and the supporting artillery unit.

This indicates the need for a lightly armored observation-communication vehicle. It could be employed by forward artillery observers and liaison personnel, as well as by air and naval gunfire control parties. All these normally land with or immediately after the assault waves of the landing force.

According to Lieut. Col. Arthur J. Stuart in an article published in the *Marine Corps Gazette:* "Such observation-communication vehicles could be special-type vehicles or, probably better, modified standard tanks. By elimination of a part of the ammunition storage and installation of suitable radio equipment, such tanks could be effectively employed and would be indistinguishable to the enemy from combat tanks. . . These vehicles, in conjunction with assault tanks, would be inconspicuous.

Fire-Direction Center

The last requirement for amphibious assault artillery is a splinterproof shelter for the artillery battalion fire-direction center. This installation should insure space for at least one officer, five enlisted men, two small tables, six telephones, a small switchboard, and built-in outlets for six wire lines and six radio remote control lines.

One solution for this is a floatable trailer having the above design characteristics which could be towed to the beach, picked up there by a tank, LVT, or self-propelled artillery weapon, and then moved into position. Another solution is to modify at least two LVT(3)'s per artillery battalion to provide for the stated characteristics.

Now that amphibious assault artillery has been provided with adequate protection, let us see how it might be employed in future assault landings.

First, as in the past, support aircraft and naval gunfire support ships and craft would conduct extensive pre-D-day, pre-H-hour, and post-H-hour destruction and neutralization missions. Next, there would be a new tactic with tanks and self-propelled light artillery, equipped with flotation devices and gyrostabilizers, preceding the assault infantry to cover the landing with close direct-support fires. Under this concept LVT(A)'s would no longer be a part of the amphibious operation, since their rôle would be taken over by tanks and light artillery.

Tank-Led Assault

If the assault were a tank-led assault, tanks would continue their run into the beach and execute an attack against beach positions. They would be covered by the fires of light artillery from water-defiladed positions. If the assault were a tank-supported one, then both tanks and light artillery would take under fire beach-line weapons and cover the landing and deployment of the assault infantry from the water.

In either case, artillery would move ashore to occupy firing positions as soon as the foreshore was crossed by the leading elements of the infantry. With the increased mobility of the self-propelled weapon, forward displacements could be made early and rapidly in order to clear the beaches for the landing of subsequent waves.

In either a tank-led or tank-supported amphibious assault, sufficient punch will be provided to insure that the impetus of the assault landing will carry the leading elements well beyond the immediate foreshore without halting. Infantry elements, in armored personnel carriers, could take full advantage of the directly controlled air and naval gunfire.

With the additional close-fire support of tanks and field artillery they might be able to drive forward as far as the force beachhead line before being forced to halt and reorganize. Forward artillery observers, in armored observation-communication vehicles, would land with the assault infantry and would be able to adjust the fires of both field artillery (initially under battery control) and naval gunfire on targets of opportunity.

Tanks which were not immediately engaged or required could be assigned a supplementary field-artillery mission and could also be adjusted and fired by forward artillery observers.

Artillery headquarters, survey, reconnaissance, communications, and fire direction center personnel could land with the reserve infantry companies. This would be done in splinterproof vehicles in order to establish battalion control at the earliest practicable time. Thus, in a matter of minutes, not hours, direct-support artillery battalions could be established ashore.

Medium artillery could be landed early, employing flotation devices or, if the progress of the assault permitted the beaching of landing ships, it could be landed directly over the beaches. Heavy artillery would usually not be landed until such time as beaching of landing ships was feasible.

Heavy Artillery

Self-propelled, splinterproof heavy artillery would still have all the desirable features of mobility, protection, and speed in occupation of position that the light and medium artillery possesses. In any event, both medium and heavy artillery could be landed considerably earlier in the future than has been possible in the past.

By reducing the inherent vulnerability of present-day field artillery and by making possible a combined-arms beach assault, the Marine Corps field artillery can and will provide a basic means of strengthening the attack in any future landing operations.

We have the time to make changes in present matériel or to develop new weapons effectively to execute the combined-arms beach assault. We must use this time to full advantage. We cannot rely on the enemy's weakness if we ever have to assault a hostile shore again.

Air Officers in Industry

A Program of Technical Education for Our Fliers

by

Maj. Gen. L. C. Craigie

On-the-job training teaches airmen the intricacies of management and production

IN a time of peace, such as the present, when the national economy demands quality of personnel and matériel as opposed to an expensive array of military quantity, emphasis is being placed on technical education within the armed forces to assure a steady flow of competent, well-trained officer specialists.

In the Air Force it has been found that matériel developments, improvements in the technology of weapons and in the systems devised for their use, demand a high level of education among those who will administer these weapons and systems. Obviously, too, the military executives assigned to the procurement, supply, and maintenance activities of the Air Force must have adequate technical-management backgrounds to permit their dealing intelligently with the representatives of industry who contribute largely to the effectiveness of today's air power.

Brain Power for Air Power

The U.S.A.F. Institute of Technology at Wright-Patterson Air Force Base, Dayton, Ohio, is coping with this need for officers well grounded in industrial administration and in the engineering sciences. It is supplying the necessary brain power to match today's air power through several programs of higher education for Air Force officers.

Of all educational programs currently in operation within the Air Force perhaps none is of more immediate practical dollars-and-cents value than the training-in-industry plan presently operating to enhance the industrial background of officer students.

A veritable 2-way street of technical knowledge has resulted from these programs. American firms and the U.S.A.F. are now exchanging know-how and information through the medium of air officers working within industry.

The Air Force side of the picture is bright indeed. Selected officers—picked for their background and working experience in such fields as aëronautical engineering, research and development, procurement, maintenance of equipment and installations, and other fields in which industry deals with the Air Force—are placed within the working organizations of industrial firms for periods of six months to a year for on-the-job training.

Everything from shop work to executive management is included in the planned program of each officer. The industries themselves lay out the plans for these students, covering all phases of plant management, production methods, time study, and labor relations.

Industry accrues, through this participation, a definite dividend in knowledge of Air Force administrative functions dealing with contract negotiations, the preparation of specifications for matériel, and all matters bearing on military procurement in general.

Aimed primarily at providing the air arm with competently trained technical specialists, the in-industry program is providing a firm personnel framework for expansion of any industrial-mobilization program should emergencies occur in the future. An intimate knowledge of industrial problems incident to tooling, supply of raw materials, devising production techniques, and incorporating new methods into practical operating procedures will enable the Air Force to deal smoothly with industrial firms in future procurement. Such knowledge will influence the very first steps in the preparation of specifications for new aircraft, instruments, and a host of other mass-produced items in constant demand by a technically advancing Air Force.

Bottlenecks

During the past war the term "bottleneck" was used variously to describe the ills and defects that beset the industrial community when it failed to produce the quantities of equipment demanded by the ever-increasing tempo of the war.

Experience has shown that the bottleneck was not only the result of exceptionally great demand but was also the end product of a widespread lack of specific knowledge in the proper places. Many other factors entered into the picture, of course—such as intermittent shortages of raw materials, restrictions placed upon transportation, conflicting priority projects, and others—but in every case the lack of applicable know-how aggravated the bottleneck.

General Craigie is commandant of the United States Air Force Institute of Technology at Wright-Patterson Air Force Base, Dayton, Ohio. During the Second World War he commanded the 63rd Fighter Wing in the Mediterranean Theater and was designated Allied Air Commander, Corsica. In 1945 he became chief of the Engineering Division, Air Matériel Command, and in 1947 was made Director of Research and Development at Air Force Headquarters, Washington, D.C.

Today's training in industry has the mission of relegating the bottleneck to the limbo of permanent bygones.

Many fields of activity have been embraced by this broad program. Transportation—rail, air, long-distance truck—comes in for a large share of the effort. With officers working within such firms as the Union Pacific, the New York Central, Watson Brothers of Omaha, Pacific Freight Lines, TWA, American Airlines, Eastern, Pan American, and other transportation giants, the Air Force looks for a continuing experience-return that will do great things for its transportation activities. Air Force-industry teamwork in this field makes for more perfect coördination of the national transportation effort in any emergency.

By the same token, officers currently working with Western Union, American Telephone & Telegraph Company, and Radio Corporation of America will bring back to the Air Force the practical commercial techniques employed by these international communications organizations.

Rubber Parts

Future handling of rubber parts for aircraft and related equipment, such as tires, tubing, instrument mounts, oxygen equipment, and other rubber items will be improved through the experience of officers training with the U. S. Rubber Company at Detroit and with the Goodyear Tire & Rubber Company at Akron. Air Force research, development, and test programs in this area will also benefit.

Much of the training-in-industry effort is, of course, conducted within the aircraft industry itself. Douglas, Lockheed, Boeing, North American, Convair, and Republic are among the manufacturers coöperating with the Air Force to bring about an ever-smoother operation and administration of their industry with regard to military aviation.

The Industrial Training Branch of the U.S.A.F. Institute of Technology is charged with the direction and operation of these in-industry activities which consist primarily of two distinct programs: (1) Industrial-mobilization training; and (2) Operational training within industry.

The industrial-mobilization training program is a high-level management type of training—a part, actually, of the over-all career program of five phases whereby officers are groomed for management assignments within the Air Force or for industrial-mobilization assignments.

"Training in industry has the mission of relegating the bottleneck to the limbo of permanent bygones."

In its initial phase, this career program in industrial mobilization provides academic preparation in some professional engineering field followed by an M.S. degree in either business administration or industrial engineering, or the academic or experience equivalent thereof. Upon completion of this first stage of the program, students enter Phase B training which calls for their assignment directly within industry for a one-year period of intensive, planned training.

For the individual officer there follows a series of assignments to Air Force procurement activities. During this period he will hold staff positions commensurate with his training and development, and at an appropriate point in his career he will be selected for attendance at the Industrial College of the Armed Forces for final schooling under the program.

Completion of this entire career plan—usually requiring a minimum of seven years of alternate training and duty assignments—will prepare officers for highest-level staff positions within the Air Force industrial-mobilization planning program or for similar planning positions under the Joint Chiefs of Staff or the Munitions Board.

Operational training within industry, the secondary program mentioned above, is designed primarily to meet immediate needs and fill existing requirements for officer specialists in given fields involving industrial participation. The trainee at this stage is being prepared for specific duties and is generally assigned to a program from a particular organization with the understanding that he will be returned to that organization upon completion of a comprehensive 6-month tour within the industry connected with his Air Force activity.

These industrial training programs are conducted largely at no expense to the Government. Exceptions to this general statement are those programs involving special classes and those which, through initial negotiations outside the Air Force, were originally established under cost contracts. Participating industrial firms are providing this essential education to Air Force officers out of patriotic considerations and a widespread desire to make smoother the channels of business between themselves and the Air Force through a more thorough dissemination of technical and administrative knowledge.

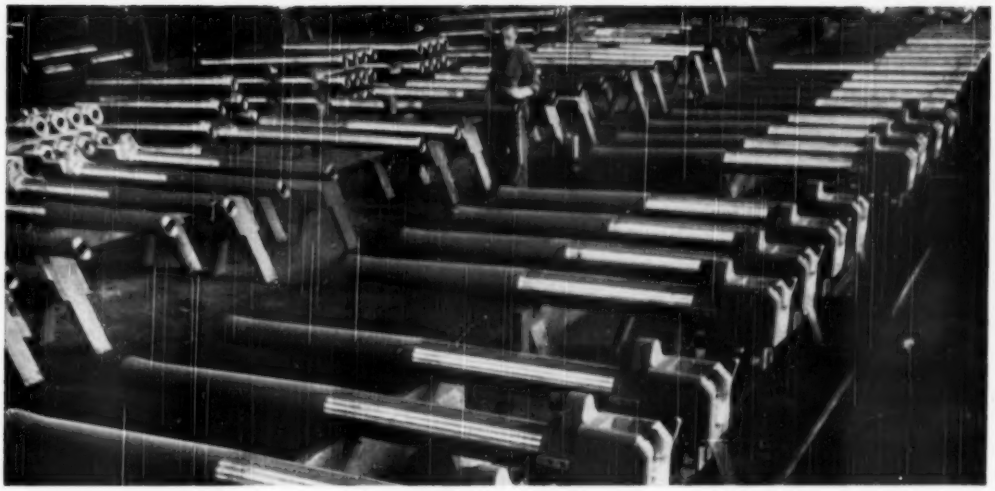
Training Schedules

Training schedules for officer students placed by the Institute are the result of specific arrangements made with the firm in which training is conducted. Personnel executives within a given company customarily assist in the establishment of these schedules. With the programs varying from 6- to 12-month periods, activity schedules are set up on the basis of the company's estimate of the time needed for the training of its own junior executives in the desired areas.

One of the most heartening features of this entire operation is the enthusiastic interest shown by participating companies. Industrial personnel at all levels have been most coöperative.

Periodic reports from both trainees and company officials—plus frequent liaison visits by Institute monitors to the participating concerns—permit an accurate evaluation of each individual's potential for future assignment purposes.

At the present time, seventeen industrial fields are covered within the training-in-industry activities. In all, sixty-three companies are engaged in the program. Present policies provide for the placement of ninety officers annually, forty in industrial-mobilization training and the remainder in the operational-training program.



Box Score of the Industry-Ordnance Team

Outstanding Record of A.O.A. and the District System

by

Herbert A. Gidney

The future of industrial-mobilization plans and of their effectiveness rests upon close coöperation in all localities between the Posts of the Association and the Ordnance Districts of the U. S. Army, Navy, and Air Force

ON May 1, 1918, I was inducted into the Ordnance Department of the Army through the simple device of a telegram, which transferred me from an infantry battalion commander at Camp Devens, Mass., to chief of the Finance Section of the Army Ordnance Department in Washington.

In time of war, one accepts such a sudden change of status as routine procedure.

Up to that time I had been interested only in the *use* of ordnance, especially small-arms equipment, and had had very little comprehension of the complicated problems involved in the business of research, design, construction, and transportation of all the matériel embraced in that simple word "ordnance."

I quickly learned, through strenuous experience, of the vast ramifications involved in the business of the Ordnance Department and of the high caliber of the officers, civilian officials, engineers, and others engaged in that endeavor.

At that time the Ordnance districts were in their infancy, and even though a year had passed since the United States had declared war, they were not too well organized.

The problem which confronted me then was to further decentralize financial payments so that contractors could get their money promptly when they had satisfactorily performed their work for the Ordnance Department.

Preparedness Plans

The confusion and delay in getting adequate quantities of American ordnance to the front in the First World War, through lack of intelligent planning, was so serious that immediate steps were taken after the Armistice in 1918 to formulate plans to prevent a recurrence in case America was ever again confronted with a world war.

Colonel Gidney is executive vice-president of the Gulf Oil Corporation, Pittsburgh, Pa., and vice-president in charge of Posts of the American Ordnance Association.

The outcome of that resolution, guided by men of vision and practical experience, resulted in the passage of the National Defense Act of 1920, under which the Assistant Secretary of War was charged with "the assurance of adequate provision for the mobilization of material and industrial organization essential to war needs."

After enactment of that legislation, businesslike policies and measures were adopted by the Assistant Secretary of War and his staff and their successors who were charged with this responsibility.

They had the foresight to invite the constructive coöperation of the successful men of industry, and the record of accomplishment of these men is well known.

I can well recall the distinguished service rendered during the period from June 1934 through July 1940 when our good friend, the Hon. Louis Johnson, was Assistant Secretary of War. The knowledge and experience which he gained in that service for industrial preparedness undoubtedly has been helpful in his present enlarged responsibility as Secretary of Defense. His fine understanding of teamwork and his forthright decisions to bring about unity and results quickly are most commendable and heartily endorsed by this Association.

The American Ordnance Association (originally known as Army Ordnance Association), through its national officers and directors and those of the Posts in the cities where Ordnance districts were re-formed, took an active part in the reëstablishment of those districts and in the course of several years developed "the Industry-Ordnance Team."

Districts and Posts

In all the districts established by the Chief of Ordnance, the A.O.A. endeavored to establish a Post governed by a strong board of directors and officers who thoroughly understood the Ordnance problem and who were so situated in the community as to be of the greatest service to the civilian district chief and his executive officer and staff.

In some of the large cities there was also established, through the coöperation of the Posts, an advisory board made up of top-flight executives whose advice was very helpful in connection with the many important problems which arose.

Officer-Secretaries

An important link was forged between the Ordnance districts and the Posts of the American Ordnance Association by having the Regular Army executive officer of the local Ordnance district act as secretary of the A.O.A. Post in that area. The position was always regarded as one of honor and opportunity and was instrumental in insuring that the district executive officer would have the greatest possible help in the discharge of his duties.

From my personal knowledge, every executive officer assigned to the Pittsburgh Ordnance District of the Army has, through that association, been greatly helped in the discharge of his official duties. It has enabled him to become well acquainted with every local official with whom he would have any business to transact, and it has been helpful in cementing personal relationships.

The Regular officers of the armed services come and go under the policy of periodic changes of tours of duty, but the civilian directors and officers of the Post, who have their businesses and homes in the community, generally carry on in the same locality year after year with progressive changes of position and responsibility. Even though some of them may be transferred to another community, they keep their contacts and lend their talents to furthering industrial preparedness in their new environment.

The district chiefs will bear me out, I am sure, that this unofficial close tie is an important relationship for the services and one that is very helpful to them.

Now that the Ordnance districts are being reëstablished in a much broader field, I would like to urge that the ordnance authorities of the Army, Navy, Air Force, and other departments of the national military establishment plan to utilize fully the services and influences of the thirty-one Posts of the American Ordnance Association, which is now so organized and conducted as to serve all departments of the armed forces.

No longer is the Association devoted exclusively to Army ordnance. It is a friend of the Army, Navy, Air Force, Munitions Board, Research and Development Board, and any other military endeavors relating to ordnance that come within the scope of the national military establishment.

The men identified with the well-established Posts are leaders of science and industry and of the community—ready and willing to be of every possible help to the services without any thought of recompense or glory other than the knowledge and satisfaction that come from useful patriotic endeavor in helping preserve the peace of our country.

Most of the Posts are in a position to interpret and popularize the important work of the Ordnance districts throughout the local area. This is especially important when general knowledge of ordnance problems becomes restricted and popular interest tends to diminish accordingly.

Teamwork

Although nearly thirty-two years have rolled by since I first became interested in ordnance, I can honestly say that the high caliber of the men with whom I have been associated and the practical importance of this endeavor has so inspired me that at no time during these three decades or more has my enthusiasm for the cause waned. I feel that the work of this Industry-Ordnance Team played a very important part in the military success of the Second World War and is playing an equally important part in avoiding a Third World War.

Many of the men on this Industry-Ordnance Team have in mind their practical experiences and the lessons learned during the past two wars, and they do not want to struggle through another one.

Effective strength is something that an enemy always understands and fears. We are a peaceful Nation, but we are also a proud one.

Army

Will We Ever Learn?

We Have Never Taken to Heart the Lessons Taught by Our Past Wars

by
Edward T. Gushée

The secret of remaining at peace is to be ready to fight to defend our liberty

THE American Ordnance Association is primarily interested in keeping the peace. As long as human nature is acquisitive as to material things and power, keeping the peace is largely dependent upon preparedness.

With an eye on our present armed services' budget, it would seem as if we had learned the lesson. However, our history shows that we have never, in our whole life as a nation, tenaciously kept to a policy of preparedness. The results of this short-sighted behavior could have been disastrous in the past and can be disastrous in the future.

An Important Story

The story of our unpreparedness in past wars is not only interesting but, historically, of vital importance. Have we matured enough as a nation to learn from the past?

Never have we been prepared. This is strikingly pointed out in the book, "Inevitable War" by Lieut. Col. Richard Stockton, now out of print. I am indebted to the Department of the Army for the opportunity to read it. This article does not purport to be a thorough review of Colonel Stockton's book. Rather, it is a commentary thereon.

Actually, as a nation, we have been just plain lucky in all our wars, including the Revolution. If it had not been for fortuitous circumstances, we might well have taken a thorough shellacking time and again. Let us look at the Revolutionary War for just a moment.

Short-Term Enlistments

It is well known that we had raw, untrained troops, but did you know that we had a total of 325,000 soldiers, at one time or another, against the British total of 150,000? Perhaps we could not have been actually prepared for the Revolution, and to that extent it is not exactly a case in point. But it is interesting to note that with such total enrollment during the war the largest number that General Washington could get for one battle was 17,000. We did not correct the error of short-term enlistments for 137 years! Note the resolution passed by Congress on June 2, 1784:

"Resolved, That the commanding officer be, and he is hereby directed to discharge the troops now in the service of the United States, except twenty-five privates, to guard the stores of Fort Pitt, and fifty-five to guard the stores of West Point and other magazines, with a proportionate number of officers; no officer to remain in service above the rank of captain . . ."

When the War of 1812 was declared, our actual enrolled strength was less than 7,000. Again we depended on untrained State-controlled militia. There's story after story of our inefficiencies, both of men and equipment. Perhaps the best illustration of it was the burning of Washington, probably the greatest military humiliation we have ever experienced. The British force numbered some 3,500, of which 1,500 were engaged. We had 5,400 men, untrained and relatively unarmed.

This army of 5,400, in defense against an attacking force of 1,500, retired with such little resistance that there were but 8 killed and 11 wounded. This is no criticism of the men. It is criticism of the foolhardiness of going

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to war without adequate training and equipment.

We won the Battle of New Orleans largely because of our strong defensive position and the fact that we had an adequate general. We had, however, as we continued to have for some time, a relatively strong Navy supported by a number of privateers. The Navy saved the country, but it didn't save the lives of those men who were unnecessarily killed because of lack of being ready.

A historian has said about the War of 1812: "For humiliating as it is for the land forces to acknowledge, it is only true and fair to state that hostilities stopped solely on account of political conditions and a successful Navy."

There were many lessons to be learned from the War of 1812, but we didn't learn them very well. Such lessons as that it is murder to send untrained militia and partly trained Regulars into combat; that an untrained officer is a menace to himself and his men; and that a soldier cannot fight without a rifle. At the close of the war, insufficient funds were provided for the West Point Military Academy, and the commandant personally had to borrow $65,000 from a private concern to keep it going.

The Mexican War

The Mexican War was another illustration of our lack of preparedness. We can thank God that Mexico was weak. We had 107,000 troops against their greatest strength of 36,000. Lack of training caused many losses—lack of training combined with lack of proper staff work and proper equipment.

We have heretofore kept the Navy pretty well in shape and let the Army go to pot! The Mexican War is another illustration of the value of the Navy. It was relatively well maintained and efficient. Mexico was impotent on the sea; hence we were able to capture Vera Cruz, which was the turning point in the war.

In our own great Civil War the Confederates got the jump on the North and had relatively trained troops at the start. It took three years before the North could bring to bear its excess power in men and industry. Even to keep in the fight, at first, President Lincoln had to enforce many extralegal acts.

It is interesting to note that the Union troops numbered 2,128,000 as against 1,000,000 Confederate soldiers. Stockton writes:

"Have we ever sufficiently considered what would have happened in 1861 had the United States possessed not a bloated military establishment but a little army in the real sense of the word, say 60,000 to 100,000 men? In the latter case it is clear that we would have possessed a safe and cheap insurance against a civil war, against the loss of hundreds of millions in property, against economic depression—almost bankruptcy—against what some modern writers argue was an actual reduction of the national vitality.

"With 100,000 men enrolled, it is probable that from 25,000 to 30,000 Regulars could have been collected with some promptness and sent to Richmond, to New Orleans, and to such other Southern cities where conditions seemed more dangerous. Any seditious tendencies would have been stamped out long before effective military resistance could have been organized. With a total of no more than 60,000 men, this might not have been possible, but at all events the Administration would have been able to give McDowell a division of 8,000 to 10,000 Regulars; and that might have made of Bull Run and of the Civil War a very different story."

This is an interesting possibility to consider, because it points up how preparedness might keep us from having a war. I think it is particularly pertinent just now. I am no alarmist, but I can imagine a situation where we might be fighting sedition among ourselves to protect our fundamental liberties.

If it hadn't been for the lives lost and the treasures squandered, our war with Spain would have been an opera bouffé. And if Spain had had even the semblance of a navy and had not been a declining power, the story might not have had a happy ending for us. As usual, we were utterly unprepared.

The population of the United States in 1898 was about seventy-three million. We had an Army of around 26,000. Many of these were in the Coast Artillery and were otherwise immobile. Twenty-six thousand men garrisoned some ninety posts. In other words, the Army was scattered throughout the country. There was practically no organization and no war plans. Few officers had ever seen as much as a regiment; none had experience in handling a large body of men. There was no such thing as a brigade, a division, or a corps. The National Guard was probably in even worse shape. Training was deficient and discipline bad.

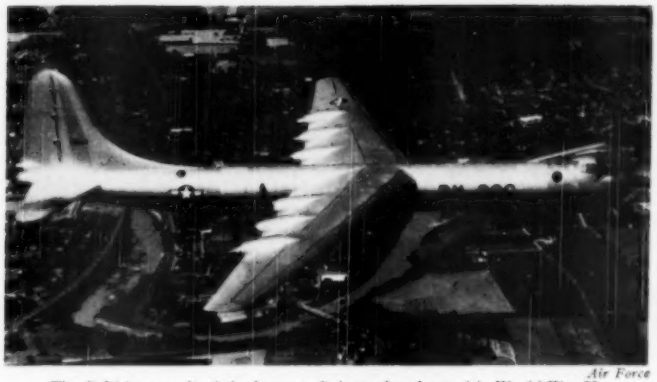
"40,000 in 10 Days"

In March 1898, the President asked Secretary of War Alger, "General, how soon can you put an army into Cuba?" and he replied, "I can put 40,000 men there in 10 days." As a matter of fact, the Army couldn't even be mobilized in ten days. It first had to be called into existence.

There were only some 67,000 Krag-Jörgensen rifles, which were the efficient rifles of that day. The National Guard was armed with out-of-date single-load caliber .45 Springfield rifles. Nine 8-inch coast-defense guns, with ten rounds of ammunition each, protected our coasts. The Navy was in relatively good shape. The Assistant Secretary of the Navy, Colonel "Teddy" Roosevelt, said, "Against a good nation we should be helpless."

Alger, after the first blush of enthusiasm, said, "It is doubtful if any nation rated as a first power ever entered upon a war of offense in a condition of less military preparation than was the United States in 1898." At that time there were not sufficient reserve supplies in the possession of the War Department fully to equip 10,000 men in addition to the Regular Army as it then stood. Stockton writes:

"Many elements of field, siege, and seacoast artillery were in a transitional state; . . . the military establishment was palpably deficient in trained artillerists; . . . the Regular Army had not been mobilized since the Civil War; one-third of a century had elapsed since



Air Force

The B-36 is a result of the lessons of air warfare learned in World War II.

the Army, as a whole, or any great part of it had been brought together; . . . there was no strategic staff and no large number of officers who were experienced in the concentration of troops or in battalion, division, or corps maneuvers; . . . there was no place in the United States especially adapted or prepared for Army mobilization, and . . . neither the Army nor any officer in it had any experience in meeting, or operating under, the new conditions incident to a campaign in the tropics."

There were a lot of strange things happening. For instance, General Miles was ordered to take 70,000 troops to Havana without any ammunition. Perhaps it is amusing to read about a soldier opening a boxcar to get needed food and finding it full of shoes, but it wasn't laughable to the soldier.

There was almost a complete breakdown in transportation. A cavalry regiment would start for port with horses; likely as not the horses would end up attached to an infantry train. In addition to shortages of equipment and clothing, medicine and hospital supplies were practically nonexistent. Men served in the tropics in wool clothing. The tropical uniforms came through after the peace was signed. And to complicate matters, members of Congress who had voted against preparedness appropriations hounded the Secretary of the Navy for ships to protect their own particular bit of coast with the result that the Navy was split and dispersed. If the Spanish fleet had not been rotten to the core, we would have taken a licking.

I was interested in reading about our great victory when Admiral Cervera was ordered to bring his fleet out of Santiago against his better judgment. Cervera knew that it was suicide—and it was. He had to bring his vessels out single file and was subject to the fire of the blockading fleet on both sides. He had little ammunition, inadequate gunnery, and rotten ships. In the naval battle off Santiago, our ships fired 6,000 shots at short range, and we made the grand total of 120 hits! Six 12-inch guns made two hits and eight 13-inch guns didn't get a hit.

The Same Story

It would seem that the United States should have learned from this past experience, but such was not the case. Although the Indian wars were on a rather small scale, there was the same kind of penuriousness on the part of Congress with the resultant suffering and loss of lives.

Before we look at the lack of preparedness in relation to the First and Second World Wars, let me cite one incident where preparedness really paid off. It was just after the Civil War when Maximilian of France invaded Mexico. The North had not yet discharged the army and so was prepared to make a display in force. Sheridan was put in command in Texas. He sent one column of cavalry under Custer to Houston and another to San Antonio. Galveston was occupied by one division of the XIII Corps with another at Brazos. The IV Corps and the XXV Corps were also stationed at strategic points. In other words, we had men and equipment properly deployed.

France knew that our Army was then equal to or better than any on earth. She withdrew her support of Maximilian, and he fell. "This incident is full of meaning. When the United States lacked power to enforce the Monroe Doctrine, France violated it. When we sent an army of trained veterans to the Mexican Border, France respected it. Preparedness probably avoided war."

"We Will Be the First . . ."

Many of us have some knowledge of preparedness conditions in the First and Second World Wars. I got a worm's-eye view of the First World War and had some personal experiences in the lack of preparedness. In both World Wars I and II, we were saved by our allies. But we know that next time, if there be a next time—which God forbid—we will be the first to be attacked.

The First World War record is extraordinary. The enemy was unable to take any serious offensive against us until we were ready. From the day that war was declared (and remember that we had warnings of war for two years) we did not have any troops in actual combat for thirteen months!

On July 14, 1915, Colonel House (President Wilson's confidential adviser) wrote to the President saying, "If war comes with Germany, it will be because of our unpreparedness and her belief that we will be more or less impotent to do her harm." We didn't have the troops and we didn't have the General Staff—or, to put it more accurately, it wasn't properly functioning although Elihu Root had organized the staff in 1903.

Pershing, when he got abroad, had to learn both general-staff and field-staff organization from the British. Consider the unpreparedness that lay behind Pershing's words: "It was my understanding that I was to go over in command of a division, and, as no such unit then existed in our Army, it was urgent that it be organized as soon as practical."

If we had been Germany's only opponent, think what the results might

have been. Did you know that in the First World War Germany's Navy was larger than ours? Think of what would have happened if England and France had not been holding the fort.

We were in the First World War a total of nineteen months. For four months of that time we had an effective force and for two of that four months we fought as a unit. Between March and May 1918, nearly a year after we had declared war, the British and French lost a total of 340,000 men. At that time we had about 125,000 men ready for combat!

The Nation did make some progress in the First World War because the Selective Service Act was passed which did away with short enlistments, was impartial, and recognized a citizen's duty to defend his country. This was the model for the act used in the Second World War.

In World War I, I do not believe that we ever flew any of our own planes in combat, and our field artillery consisted mainly of French 75's. On the whole, however, our troops did not suffer too much, particularly because of the time our allies gave us, but the costs were very much greater than if we had been properly prepared. It can be said that our Nation and the Allies had learned certain lessons from past fiascoes about training men and officers and about equipment and organization.

History repeated itself in large measure after World War I. Despite the grievous record of unpreparedness, we went through the same kind of postwar hysteria, broke up the Army, went through the Nye investigations, and in the same old fashion put our head in the sand!

In the twenty or more years between the wars, two things stand out in my mind as illustrating the slow starvation to which the services were subjected.

"History repeated itself in large measure after World War I. Despite the grievous record of unpreparedness, we went through the same kind of postwar hysteria, broke up the Army, went through the Nye investigations, and in the same old fashion put our head in the sand!"

The tank was the development of the last phases of the First World War. All military men expected tanks to be important in the next war. And yet the Ordnance Department received sufficient funds to build only a handful of tanks in 20-odd years. The other fact is this: the machine tools for making cannons, guns, ammunition, etc., in Army arsenals were ancient and outmoded (and that in a country which has led the world in production).

Lack of Interest

This lack of preparedness came because we, as representative citizens, were not interested enough to get something done. Again, in World War II, we were saved by our allies. It is true that certain helpful advance precautions were undertaken, but those who were in Washington in January 1942 and saw the desperate scramble for material realized as never before the costliness of unpreparedness.

Let's examine the future in relation to preparedness. There are some new cards in the deck. Do they change the fundamentals? Is war inevitable and if so what must we do about it? I don't know the answers to these questions, but we can take a look at history and attempt to draw some conclusions.

One thing is crystal clear and conclusive as far as our country's history goes: the lack of preparedness has been terribly costly in lives and money and except for the luck of the game, weak opponents, political considerations, and the valor of allies, we would have taken a number of bully good lickings.

It has been said that war is inevitable because of the essentials of human nature, and, disagreeable as it is, we must face the fact that all history has proved that conclusion true. We now have a new element to consider, the effect of which cannot be evaluated. I refer to the atomic bomb and to all the new weapons.

The End of War?

Is it possible that because of the increasing dreadfulness of war, the fact that future wars may be wars of annihilation—not of armies but of peoples—mankind will give up war? There are other quite similar parallels in the past. The invention of gunpowder was, I dare say, almost as earthshaking in relation to war at that time as the atomic bomb is at this time. But it didn't stop war.

Does the present state of foreign relations and our position in regard to Russia and Russia in regard to us argue that there will never be another war? Do you suppose that there will never be another man like Hitler? There have been a lot of them before in the world. I frankly don't know, and, not knowing, I say that we should take our lessons from history and keep ahead of the game. Keep out in front in research and trained man power until we do know what the effect of recent developments in relation to future wars may be.

Air Force

We must be prepared to defend our vital targets against modern airborne attack.

Army photo

Small Arms—King Size

Recoilless Rifles Begin a New Era in Infantry Weapons

by

Dr. L. B. Hedge

Chief, Recoilless Weapons Section, Army Ordnance Research and Development Division, Washington, D. C.

IN the courtyard of a somewhat shot-up hotel in Essen, Germany, a few weeks before V-E Day, I watched an American soldier using his handkerchief to rub the last vestige of dust from a weapon of unusual appearance. He eyed the job with some satisfaction, stepped back to survey his rifle—the 57-mm. T15E13 (even then being standardized as the M18)—with obvious pride. He was one of a scant dozen men who had carried the new rifle through its first combat action—the airborne crossing of the Rhine near Wesel. On this sunny April morning in 1945 the affection which generations of fighting men have found for weapons personally tried and proved was as evident on his face as the love of a schoolboy for his first sweetheart.

This affection, shown in various ways by the men who first used these new rifles in combat, was not an accident of chance compatibility. These rifles were made for the men who would use them. They were not perfect as weapons—they were, in fact, early development models lacking many of the features to be found in the standard rifle as now

Ordnance photo

The author testing an early 57-mm. recoilless rifle.

Army photo

A production model of the 57-mm. rifle in combat.

issued. However, they had been designed and built with the individual user constantly in mind. I believe the perspective of that development will interest every man who has lived with individual arms and has learned that "grip," "drop," "cast," and "balance" are terms of personal significance to the shooter and not just a part of the professional gunsmith's jargon.

Much has been written of the principles of operation of the recoilless rifles (a rearward gas blast counteracts the momentum which is recoil in a conventional firearm) and of the speed with which they were developed (twenty-one months between the start of paper work and combat employment).

The basic principles which underlie the designs were known to Newton, and weapons of the same technical character were patented in the World War I period. The development which placed the 57-mm. M18 and 75-mm. M20 rifles as standard weapons in the hands of our troops paralleled other projects based on the same operating principles both here and abroad.

The success of the M18 and M20 may be credited in large measure to the philosophy which guided them to completion and which made them, in spirit and in fact, the world's largest small arms.

Initial Development

The recoilless-rifle development was initiated in the Army's Ordnance research and development group by the men who had brought the "bazooka" and the M1 (Garand) rifle through their infancy. The recoilless rifle was conceived as an answer to the need for an individual weapon of greater power. It had more range and accuracy than was possible with a conventional shoulder-fired rifle or rocket-and-launcher combination. It was a small arm to give the infantry new fighting horizons.

While the first experimental models of the 57-mm. rifle were still being fired electrically from behind barricades and with slugs simulating the yet-to-be-designed shell, wooden mock-ups were being tested for convenience of handling and comfort of firing positions. In the group actively working on recoilless rifles in these early days were men whose experience with the weapons a man carries and uses had been gained in the invasion of North Africa, in the Dieppe raid, and in hunting. These experiences ranged from the Scotch Highlands and the Australian bush to the frozen fastnesses of Little America.

Later Improvements

Safety devices, sights, firing mechanisms, the bipod shoulder rest, and the extendable handle of the 57-mm. rifle were conceived and laid out by these men working with mock-ups and preliminary models in their hands and on their shoulders. They brought to this work discriminating judgment acquired through long association with small arms, strengthened by sound engineering training, and refined in close experience with fighting and the men who do it.

The basic weapon comprises an enlarged chamber, partially closed at the rear by a breechblock containing Venturi tubes and the firing pin and opening at its forward end into the rifled tube. The round, consisting of a loaded primed case, perforated to permit gas escape and with its projectile crimped into its mouth, is supported by the breech and the tube and is head-spaced from a ring attached to the case near its forward end.

The shell is fitted with a preëngraved rotating band which is engaged with the rifling of the tube on loading. Inclination of the Venturi openings with respect to the rifle axis counteracts the torque transferred to the weapon as a reaction to the angular acceleration of the projectile.

Preëngraving of the projectile, employed initially to approximate the conditions of the smoothbore test rifle in the rifled test weapon, has been retained for its advantages in reducing performance variations from round to round, reducing weight by elimination of engraving stresses in the tube, and reducing the probable departure from absolute recoillessness in the actual weapon.

Engraving imposes tremendous stresses on the tube at the origin of rifling and requires additional strength in the tube which can be supplied only by increasing its thickness and consequently its weight.

Experimental models of the recoilless rifle were acclaimed by the infantry, but not without reservation. Extensive tests by and for the soldiers who would soon use these new rifles led to the elimination of many operational difficulties and the incorporation of new design features which contribute to the convenience and reliability of the weapons.

Accelerated development was carried on by a commercial facility which had set engineering and production records with caliber .50 machine guns. In the hands of these men, and under the active direction of the original group which had started the job, the 57-mm. rifle was carried through several interim designs to standardization. The active and continuing coöperation of infantry test groups contributed greatly to the speed and success of this later developmental phase of the job.

Leaning heavily on experience gained with the 57-mm. rifle and under the direction of the same Ordnance soldier-engineers, the 75-mm. M20 rifle followed a similar, though more rapid, development pattern. It was placed in the hands of the same units that took the 57-mm. rifles into action and went into that action with them. The stories of the 75-mm. rifle crews are stories of men who had found reliable battlefield friends.

Although the Germans had started development of weapons based on similar technical principles long before our work in this field began, and although models of both German and Allied recoilless weapons had been built and fired before the first preliminary tests in the 57-mm. rifle program had been made, the 57-mm. and 75-mm. rifles were the only weapons of this type introduced in number or used effectively in World War II.

With these rifles the term "small arms" has cast off its secondary connotation of "small-bore arms" and has regained its proper meaning—arms that are small—arms that are carried and used by individual men or by small groups of men.

EXERCISE PORTREX

Defense Dept. photos

The largest U.S. peacetime military maneuver in history and our first amphibious-airborne exercise was held in March when 80,000 soldiers, sailors, airmen, and Marines participated in a combined-operations attack on the island of Vieques near Puerto Rico. More than 700 aircraft and 160 ships of all types also were engaged. The maneuver was a valuable test of our techniques and equipment, it provided excellent cross-education of service personnel, and it highlighted many shortcomings which will be corrected in future training.

Using modern portable radio equipment these troops set up a communications center in preparation for the Vieques assault.

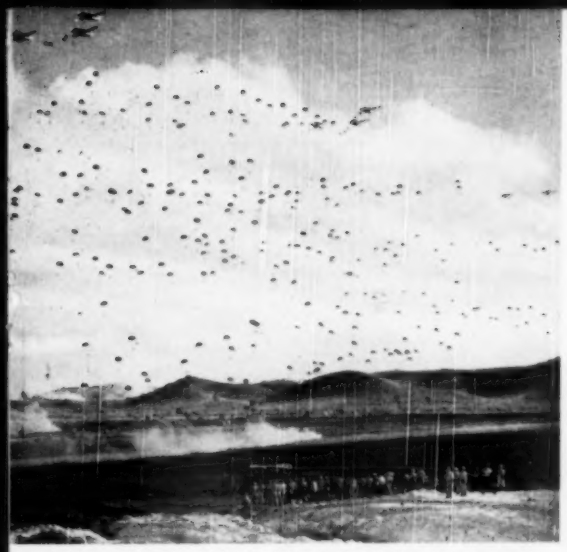
Defending forces prepared formidable antitank barriers, but once through them armor spearheaded the invasion.

Invasion troops in battle dress clamber down loading nets into bobbing landing craft preparatory to the beach assault on "Aggressor" forces.

Paratroopers of the famous 82nd Air landing strip on Vieques and start the

Camouflaged with tropical foliage, this tank is on the prowl for hostile troops.

Multiple caliber .50 antiaircraft guns pelled mounts are poured ashore from



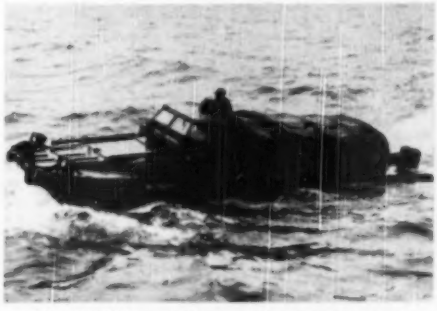
borne Division hit the silk from C-82 Fairchild Packets to capture the airborne-amphibious invasion as official observers (foreground) look on.

After hitting the airstrip this paratrooper quickly readies a caliber .30 machine gun and ammunition.

Corp. Leonard Tinney, assistant gunner with the 10th Field Artillery, takes a practice sight with his 105-mm. howitzer.

The realistic maneuvers caused some actual casualties, some of which are shown being treated on Red Beach.

on half-tracks and twin 40-mm. antiaircraft cannon on self-pro- an LST as the invaders prepare to defend a beachhead from air attack.



The DUKW amphibious truck proved its war-tested worth in supplying the invaders' beachhead.

While other airborne fighters are still parachuting to earth, those first to land are assembling and setting up weapons to defend the captured airstrip from possible counterattack. The paratroops later made juncture with the forces pushing in from the beach.

Among the observers were (left to right): Navy Secretary F. P. Matthews, Lieut. Gen. W. H. H. Morris, Defense Secretary Louis Johnson, and Maj. Gen. Ray Porter. James L. Walsh, A.O.A. president, was also an observer.

Left, LSU's coming into an LSD (landing ship, dock).

The chaplains below—Comdr. F. T. O'Leary (left) and Lieut. Col. M. H. Imrie—advised the chief umpire on spiritual-leadership factors.

Month by Month: High Lights of the National Defense

"I Was There"

Fleet Adm. William D. Leahy's book "I Was There" (Whittlesey House) is easily one of the best commentaries on the policies of the high command in the Second World War yet to come off the press. It is by far the most refreshing of the long list of such texts to be published thus far. The Admiral pulls no punches. He does not hesitate to say when he disagreed with the Commander in Chief for whom he was serving as Chief of Staff and as advance guard for the subsequent office of Chairman of the Combined Chiefs of Staff.

Members of the Ordnance fraternity can take added pride in this forthright book because its author at one time in his long naval career was Chief of the Bureau of Ordnance of the Navy. Parenthetically, but nonetheless appropriately, let it be recalled that some of the Navy's most brilliant and the country's most distinguished officers and statesmen have served in that important rôle. In more recent times, in addition to Admiral Leahy, there were Admirals Stark, Block, Blandy, and Hussey. Admiral Noble, the present incumbent, is a worthy successor in this outstanding line.

But to return to "I Was There." Except for Secretary Stimson's memoirs there has been far too much hedging in discussing some of the crucial decisions of the latest world conflict. The reasons for the outcome at Yalta still remain a mystery. None of the generals who have written on the subject have met the issue squarely. Mr. Churchill's memoirs on this point are being awaited anxiously. It remains thus for Admiral Leahy, with frankness for which Ordnancemen are noted, to speak out simply and fearlessly on what he thought about major happenings even when he disagreed with Presidential decisions he could not change.

His position on the power of the atomic bomb and on its use at Hiroshima and at Nagasaki are in point. Take the following quotation from the Admiral's book as an example:

"I realized that my original error in discounting the effectiveness of the atomic bomb was based on long experience with explosives in the Navy. I had specialized in gunnery and at one time headed the Navy Department's Bureau of Ordnance. 'Bomb' is the wrong word to use for this new weapon. It is not a bomb. It is not an explosive. It is a poisonous thing that kills people by its deadly radioactive reaction more than by the explosive force it develops.

"The legal possibilities of atomic warfare in the future are frightening. My own feeling was that in being the first to use it we had adopted an ethical standard common to the barbarians of the Dark Ages. I was not taught to make war in that fashion, and wars cannot be won by destroying women and children. We were the first to have this weapon in our possession and the first to use it. There is practical certainty that potential enemies will have it in the future and that atomic bombs will sometime be used against us. . .

"I am forced to the reluctant conclusion that for the security of my own country, which has been the guiding principle in my approach to all problems faced during my career, there is but one course open to us: Until the United Nations or some world organization can guarantee—and have the power to enforce that guarantee—that the world will be spared the terrors of atomic warfare, the United States must have more and better atom bombs than any potential enemy."

The Hydrogen Bomb

The famed Dr. Robert A. Millikan, "Billion Volt Sparkplug" of the California Institute of Technology, on his 82nd birthday, brought a breath of reassurance when he expressed doubt that a hydrogen bomb can be made. In an Associated Press dispatch, Dr. Millikan, well known especially to members of the Ordnance fraternity said:

"With all the talk about the hydrogen bomb, I am not yet convinced that it is at all certain we can build such a bomb. Of course if it were possible to make the hydrogen in all the seas combine at once into helium, we probably could explode the whole earth and transform it into a nebula." Continuing, the wise counselor said:

"We may be lost if we fail to maintain the American way of life against Socialist trends which threaten our personal freedom. We must make it very plain to Russia that we will go ahead without her if she won't join with us in this ideal. Above all, we must be too strong to be attacked, pacifists to the contrary."

This observation serves to emphasize the doubt which exists in many quarters as to the wisdom of the press-agented announcement that the United States will proceed with the production of the hydrogen bomb. The intention may be entirely sound, but the announcement of the fact to the world seems of doubtful strategic value.

For one thing, such a tactic is a mighty stimulant to an unending and fruitless arms race which can bring only destruction—economic if not physical—in the long run. For another thing, that kind of big talk with its frightening implications serves mostly to stimulate the war of nerves which is being waged skillfully enough by forces none too friendly to us.

Tall talk about what we shall do about any new weapon had best be kept within the inner councils of the high command, thus retaining the element of surprise which is so vital for the success of all new weapons. Our present course both destroys the surprise so essential to the effective use of a new weapon and likewise fans the public fear to the point that turns one of the

strongest elements of psychological warfare against ourselves. It's about time we kept our collective mouths shut about how we will defend ourselves with new and untried weapons if an aggressor ever strikes first.

Atomic Preparedness

Somewhat in the same vein but of more constructive purpose is the study prepared by the Atomic Energy Commission on "Damage from Atomic Explosion and Design of Protective Structures." The Commission released the first of these studies several months ago. It was "Medical Aspects of Atomic Weapons."

Tentative recommendations of the Commission as to multistory, reënforced-concrete or steel-frame buildings are: that the designer "assume a horizontal wind component of 90 pounds per square foot and a vertical component of 70 pounds per square foot for protection against structural collapse from an atomic bomb releasing energy equivalent to 20,000 tons of TNT exploding at a horizontal distance of one-half mile and a height of approximately 2,000 feet."

Such precautions are not being heeded. As one travels about it is quite apparent that the atomic-bomb threat is not being taken seriously by city planners, private builders, or public constructors. Else how account for the erection of new bridges but a stone's throw from existing structures? Or power plants in the very center of highly populated areas?

The whole problem of dispersal of new structures is grossly neglected just as other vital phases of civilian defense are kicked from pillar to post. Here is a phase of our national security which requires—but is not receiving—the attention its seriousness has long since warranted. It would be wise for all of us to do something effective about it on a national scale. Isolated community projects are a step in the right direction but are not a big enough step by any means.

Firming Terra

An ocean beach, a soupy mud road, or a muddy pasture can be turned into a stable, rubbery surface suitable for amphibious landing operations, the movement of heavy vehicles, and the landing of aircraft in less than five hours by a new chemical process for the stabilization of soils developed at Massachusetts Institute of Technology by the Army Engineers.

The treatment can be used even on soils which contain as much as thirty per cent water by weight—enough water to make clay as soft as bread dough. The result, after a few hours, is a soil material of rubberlike consistency well adapted to withstand heavy impact loads and to distribute static loads over an uneven foundation.

The actual soil-stabilization process is based on calcium acrylate, an organic chemical which is adsorbed by the soil particles. The application of two other compounds, sodium thiosulfate and ammonium persulfate, cause the calcium acrylate molecules to lock themselves together. Thus the soil particles are joined as the "innocent bystanders" in a simple, fast chemical reaction. The binding action begins two minutes or less after the mixing has taken place, and five hours after treatment the soil is an elastic mass with tensile strengths from five to ten pounds per square inch.

Guided-Missile Training

Heartening reports come in the form of progress by the Army in the realm of training troops in the effective use of guided missiles. A guided-missile training group under the jurisdiction of the Army Field Forces has been established at Fort Bliss, Tex. The group will consist of three battalion-size units which will conduct simultaneous and successive phases of training.

The first battalion will be composed of highly trained personnel now available to the Army Field Forces. Its mission will be to develop cadre for the units of the third battalion which will conduct the service-testing of experimental guided-missile weapons. The most highly trained guided-missile specialists will come from the first battalion. The second battalion, formed and trained simultaneously with the first, will conduct guided-missile preliminary indoctrination and advanced individual training. The third battalion will have a threefold purpose: (1) To provide guided-missile units to assist in the service testing of guided-missile weapons; (2) to develop tables of organization and equipment for operational guided-missile units; and (3) to conduct unit training and develop guided-missile tactical doctrines. The over-all organization will be capable of rapid expansion.

Control of the Atom

The esteemed Bernard M. Baruch contributed a monumental thesis to the Spring 1950 issue of *Air Affairs* on "International Control of Atomic Energy." His advice in this important field is as sound as has been his guidance in all matters related to the national defense since his gigantic contribution to victory in the First World War thirty-two years ago.

Had our people followed his advice on effective mobilization policies in the Second World War the cost of that conflict in American lives, ideals, and treasure would have been far less. It is safe to say that as to price-control policies alone Mr. Baruch's plan, if followed, would today be reflected in a national debt vastly decreased due to lower costs.

Once again Mr. Baruch gives sage counsel, particularly on the subject of information on atomic energy. In his *Air Affairs* article he writes:

"American progress in atomic energy might be speeded through the widespread dissemination of scientific information. By the same token, such publication must be expected to speed progress in Russia as well. How much was Russian progress spurred by the publication of the Smyth Report or by the sale of strategic equipment necessary for atomic development? The advantages of releasing any specific piece of atomic information must be weighed against the risks with the doubts resolved in favor of American and world security.

"Science cannot be set completely free in a world that is not really at peace. The cold war requires all of us to forego some of the ways of peace. No one can say now how long the present struggle will endure, but until peace

does come we must hold our resources together, with each of us conscious of the obligations we must bear.

"It may well be that no atomic-energy agreement will be possible until there is an over-all peace settlement. We may have to live with the failure to control atomic energy for the rest of our lives. If that is to be our lot, let us face it steadfastly and resolutely with faith in the civilization we defend. The acid test of the strength of any society is the self-discipline of its adherents."

Chemical, Biological and Radiological Defense

Concentration by the Army's Chemical Corps on toxicological and bacteriological warfare was pointed up recently with authorization requests from Congress for $12,872,000 for facilities at Dugway Proving Ground, Utah, and Camp Dietrick, Md. At the former site the Army has planned a proving establishment which is expected to cost $21,510,000 for experimental testing and operational evaluation in chemical and biological warfare and radiological defense. The Army said that "Many of the chemical items to be tested require isolation from inhabited areas and large separate test areas for some of the items to be tested because of their toxic nature."

It was stated that "new means of dissemination, protection, and decontamination are in advanced stages of development and require field tests." As a result of large-scale tests, the Army reported, "it is possible that the present tactical and strategic concepts in the fields of chemical, biological, and related fields of classified warfare will be radically revised."

At Camp Dietrick the Army will use $2,872,000 for a central boiler plant and for specialized laboratories, including a plant science building, bacteriological development laboratory, agent control laboratory, animal breeding facilities, and decontamination facilities. An animal barn and corral also will be built. It was reported that the Research and Development Board has ordered accelerated research on the dangers from intentionally introduced animal diseases in the event of emergency.

NEW SALES PAMPHLET

A new pamphlet designed to assist businessmen who wish to sell the Army their products explains how both large and small firms may enter the Army procurement field and gives continuing assistance to businessmen who have dealt with the Army in the past. Title of the publication is "How To Sell to the United States Army." Copies of the pamphlet are available for individuals on written or personal application to the Procurement Information Center, Department of the Army, Room 3D 745, or to the Munitions Board Central Military Procurement Information Office, Department of Defense, Room 3D 760, both located in the Pentagon, Washington 25, D. C.

The Army Chemical Corps also recently invited bids on the production of 175,000 new lightweight gas masks as replacements for the World War II type which are deteriorating from age. This is in addition to 122,000 such masks now in production. Further contracts will be let as funds become available, until every soldier is equipped with a new-type mask. The old masks will be replaced as they become unfit for combat service.

The new gas mask, designated the M9, is lighter, more efficient, and less hampering to the soldier than any of its predecessors. The air-purifying canister is attached to the cheek, eliminating the need for a hose. Improvements in design permit better visibility, less misting of the eyepiece, and easier breathing. The cylindrical canister protects against field concentrations of all known war gases. Either right- or left-hand models of the new mask are available in varying sizes.

Thomas E. Murray

The appointment of Thomas E. Murray of New York to the Atomic Energy Commission is excellent. Mr. Murray has the engineering skill, industrial standing, and, above all, the integrity which combine to make his availability for the post a real national asset. He is well known among the Ordnance fraternity, having contributed in outstanding degree to the success of the Ordnance production program in the Second World War.

Long a member of the American Ordnance Association, he served for several years as a director of its New York Post.

Born in Albany, N. Y., Mr. Murray was graduated from the Sheffield Scientific School of Yale University with a degree in mechanical engineering in 1911. He is president of the Metropolitan Engineering Company and a director of the Murray Manufacturing Company, both of New York. He is also a director and member of the finance committee of the Chrysler Corporation and a trustee of the Bank of New York and the Fifth Avenue Bank. He has been granted some 200 patents in the electrical and welding fields.

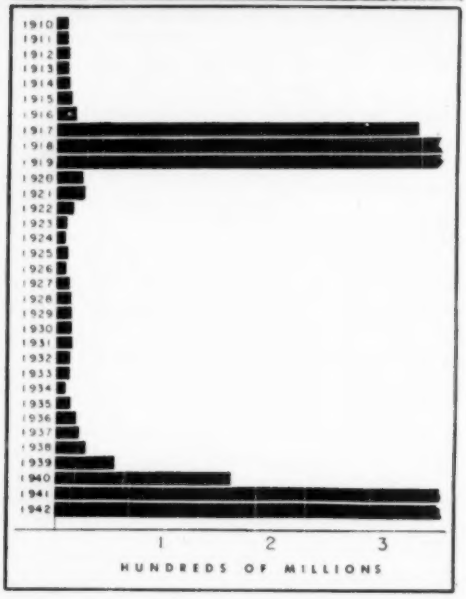
His contributions to the production engineering of ordnance, especially of shells and grenades, was particularly noteworthy.

One of his sons, Col. Thomas E. Murray, Jr., served with distinction at Frankford Arsenal and later in the New York Ordnance District during the war.

Mr. Murray's civic consciousness has been shown in marked degree on many occasions. In addition to his many industrial responsibilities he served from 1932 to 1940 as Federal receiver for the Interboro Rapid Transit System of New York, winning the high commendation for this service of then Federal Judge Robert P. Patterson, later Secretary of War. Again in 1947 Mr. Murray was named chairman of the trustees of the United Mine Workers' welfare and retirement fund. He resigned this post on January 16, 1948, because of the lack of agreement on a pension plan for the miners.

The pressing and far-flung problems of the atomic-energy policy of the United States, both nationally and internationally, will find in Mr. Murray the wisdom, prudence, loyalty, and practical engineering experience which will undoubtedly redound to the benefit of our people who have been sorely tried and decidedly tired by the atomic-energy record thus far.

"Superior Ordnance Saves Lives"



AN Industrial Orientation Conference was conducted at the Pentagon, Washington, D.C., by the officers and directors of the American Ordnance Association for the civilian heads and ranking officers of the armed forces on February 15, 1950. Purpose of the conference was to report the progress being made by the Technical Divisions and Committees of the A.O.A. in the solution of problems of quantity production of ordnance for the Army, Navy, and Air Force.

James L. Walsh, Association president, is shown above opening the conference by explaining a 50-foot graph on which were plotted the yearly dollar expenditures for Army ordnance equipment from 1910 to 1942. Cut at the left shows detail of the chart. Except for the periods during the First and Second World Wars, the lines are hardly visible. In 1939 the expenditure was $50 million; in 1940, $160 million; in 1941, $3,675 million; and in 1942, $30,875 million. The latter line runs out to nearly 50 feet on the chart!

A similar chart pictured below shows that the aggregate killed-in-action losses of the American armed forces in World War II (313,000) were only 20 per cent of such losses of enemy troops opposed to them (1,592,600). As General Eisenhower said: "We were able to use technology and machines to save lives." (Illustrations are from Army photos.)

A.O.A. Industrial Orientation Conference

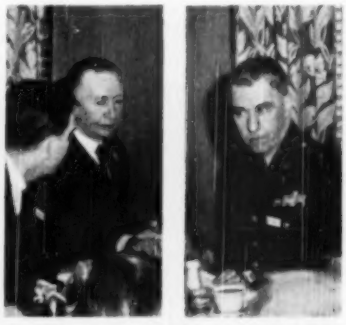
Army Secretary Gordon Gray (left, above), A.O.A. President James L. Walsh, and A.O.A. Staff Consultant Burton O. Lewis see Walter N. Howley (right), chairman of the Association's Shell Committee, open the series of discussions at the Industrial Orientation Conference which was attended by a capacity crowd of notables (left).

Gen. Omar N. Bradley (left), Secretary Gray, and President Walsh chat during luncheon.

Speakers at the conference included the following (left to right): Louis Polk, Ralph L. Goetzenberger, Harry M. Day, and Mark L. Sperry.

The following also addressed the conference (left to right): William T. Roach, F. F. Hickey, E. T. Gushée, and John F. Young.

Other luncheon guests included (left to right): Don M. Compton, James S. Bush, Gen. J. Lawton Collins, Maj. Gen. James H. Burns, Herbert A. Gidney, Archibald S. Alexander, Louis Polk, Mark L. Sperry, and Col. Merle H. Davis.



Rear Adm. A. G. Noble, Navy Ordnance Chief (second from left), and Maj. Gen. E. L. Ford, Army Ordnance Chief (right), also attended.

On the Industry-Ordnance Team

R. A. Williams

C. F. Hood

E. B. Gallaher

Rear Adm. J. A. Snackenberg

R. L. Maxwell

R. Arthur Williams, Chicago, Ill., president of the Standard Railway Equipment Manufacturing Company, helped organize the St. Louis Post, A.O.A., in 1927. Long an officer of the Ordnance Reserve, he took an active part in the huge ordnance-production program during the Second World War.

Clifford F. Hood, Pittsburgh, Pa., is president of the Carnegie-Illinois Steel Corporation and director of the Pittsburgh Post, A.O.A. He was formerly president of American Steel & Wire Company and president of the Association's Cleveland Post.

Edward B. Gallaher, Norwalk, Conn., head of Clover Manufacturing Company, was recently honored by his alma mater, Stevens Institute of Technology, at Hoboken, N.J., when he received the honorary degree of engineering. Last month he was elected a Fellow of the American Society of Mechanical Engineers. Mr. Gallaher for several years was the author of the Association's AMERICAN ORDNANCE LETTER.

Rear Adm. John A. Snackenberg, Washington, D.C., is Deputy Chief of the Bureau of Ordnance, Navy Department. He has had long service in naval ordnance as well as with ships at sea.

Russell L. Maxwell, New York, N.Y., is vice-president of American Machine and Foundry Company. A graduate of the United States Military Academy, he was Administrator of Export Control, head of the U. S. Military Mission to Cairo, Commanding General of the United States Forces in the Middle East, and General Marshall's Chief of Supply. He was a former secretary of the A.O.A. and an editor of ORDNANCE.

Robert C. Downie, Pittsburgh, Pa., is chief of the Pittsburgh Ordnance District and president of Peoples-Pittsburgh Trust Company. Colonel Downie served as chief of the district during the latter part of the war.

Follett Bradley, New York, N.Y., is assistant to the president and aviation coördinator of Sperry Gyroscope Company, Great Neck, N.Y. During the Second World War he undertook a special mission to Russia in March 1943 and later was Air Inspector, Headquarters Army Air Forces.

Lt. Comdr. Clarence Cisin, U.S.N., Washington, D.C., is assigned to the National Organizations Branch, Division of Public Relations, Department of Defense. During the war he was commanding officer of an LST in the New Guinea area. He is widely known in industrial and marine circles for his achievements in civilian and military public relations.

Harry L. Erlicher, Schenectady, N.Y., is vice-president of General Electric Company in charge of purchasing and traffic. A member of the Hoover Commission, he has assisted the Secretary of the Army in the coördination of supply activities of the Army's technical services.

John L. Young, Pittsburgh, Pa., is vice-president in charge of engineering, National Tube Company. During World War II he was engaged in the design and construction of an aluminum sheet rolling mill at Trentwood, Wash. He is presently engaged in development work for National Tube.

R. C. Downie

Follett Bradley

Lt. Comdr. Clarence Cisin

H. L. Erlicher

J. L. Young

ASSOCIATION AFFAIRS

• **AT WASHINGTON**—The thirty-first annual meeting of the officers and directors of the American Ordnance Association was held Wednesday, February 15, 1950, at Washington, D.C. At the invitation of Hon. Gordon Gray, Secretary of the Army, the meeting was held at the Pentagon.

The budget session in the morning was devoted to routine reports of officers for the year 1949 and to the consideration and approval of plans and programs, including the budget of income and expenditures for 1950. In addition to Colonel Walsh, the following officers and directors were in attendance:

Herbert A. Gidney, vice-president in charge of Posts of the Association; executive vice-president, Gulf Oil Corporation, Pittsburgh, Pa.

C. Jared Ingersoll, director of the Association; chairman, Kansas, Oklahoma & Gulf Railroad, Philadelphia, Pa.

Reginald E. Gillmor, director of the Association; vice-president, the Sperry Corporation, New York, N. Y.

John Slezak, director of the Association; president, Turner Brass Works, Chicago, Ill.

Henry P. Erwin, treasurer of the Association; director, Riggs National Bank, and chairman of the finance committee, George Washington University, Washington, D.C.

The following members of the staff of the Association's national headquarters at Washington were also in attendance: Leo A. Codd, executive vice-president; Florence G. Ferriter, secretary; Burton O. Lewis, staff consultant; Roger E. Lewis, managing editor of ORDNANCE and other A.O.A. publications.

In addition to other reports, Colonel Erwin submitted the annual audit report of Ernst & Ernst, certified public accountants, as of December 31, 1949. The financial records of the Association have been audited annually by Ernst & Ernst since 1924.

At the luncheon which followed the budget session addresses were made by Rear Adm. Albert G. Noble, Chief, Bureau of Ordnance, Department of the Navy; Maj. Gen. Richard C. Coupland, Director of Armament, United States Air Force; and Maj. Gen. E. L. Ford, Chief of Ordnance, United States Army.

A distinguished company of civilian and military heads of the Department of Defense attended an orientation session of the meeting in the afternoon. Led by Secretary Gray, the guests included: Gen. Omar N. Bradley and Lieut. Gen. A. M. Gruenther for the Combined Chiefs of Staff; Gen. J. Lawton Collins, Chief of Staff, and Gen. Wade H. Haislip, Deputy Chief of Staff for the Army; Vice Adm. Donald B. Duncan, Commander, Second Task Fleet, and Vice Adm. John D. Price, Vice Chief of Naval Operations, for the Navy; Gen. C. B. Cates, Commandant, United States Marine Corps; Arthur S. Barrows, Under Secretary of the Air Force; and Maj. Gen. A. W. Vanaman, U.S.A.F., Commandant, Industrial College of the Armed Forces.

The following reports were presented on behalf of the Ordnance Association:

"Fire Control Instrument Division" by Ralph L. Goetzenberger, deputy chairman of the Division, and vice-president of Minneapolis-Honeywell Regulator Company, with headquarters at Minneapolis, Minn.;

"Shell Committee" by Walter N. Howley, chairman of the Committee and president of Lansdowne Steel & Iron Company, Morton, Pa.;

"Cartridge Case Committee" by Harry M. Day, member of the Committee and vice-president of Ekco Products Company, Chicago, Ill.;

"Small Arms and Small Arms Ammunition Division" by F. F. Hickey, deputy chairman of the Division and president of Savage Arms Corporation, Utica, N. Y.;

"Gage Industry Division" by Louis Polk, chairman of the Division and president of Sheffield Corporation, Dayton, Ohio;

"Fuze Committee" by Mark L. Sperry, Jr., member of the Committee and vice-president of Scovill Manufacturing Company, Waterbury, Conn.;

"Optical Committee" by William T. Roach, chairman of the Committee and manager of Hawkeye Works, Eastman Kodak Company, Rochester, N. Y.;

"The Ordnance District System" by Edward T. Gushée, chief of the Detroit Ordnance District and vice-president of Detroit Edison Company, Detroit, Mich.;

"Gun Forging Committee" by John F. Young, member of the Committee, National Tube Company, Pittsburgh, Pa.

"Artillery Division" by J. E. Trainer, chairman of the Division and vice-president of Firestone Tire & Rubber Company, Akron, Ohio.

At the dinner-meeting held at the Metropolitan Club, Secretary Gray paid tribute to the Association and emphasized the contribution it has made to industrial-preparedness progress in war and in peace. The Ordnance district chiefs, their deputies, and the commanding officers of the manufacturing arsenals of the Army Ordnance Department were accorded special honors. The close relationship between the Ordnance Association on the one hand and the Ordnance districts and arsenals on the other was the theme of an address by Colonel Gidney who spoke on behalf of the Association. His remarks are published in full on page 385 of this issue. Photographs taken at the orientation session of the meeting are on pages 400 and 401.

• **AT MINNEAPOLIS**—The directors of the Northwest Post held their annual luncheon meeting at the Minneapolis Club,

• Hon. Louis Johnson, Secretary of Defense of the United States, a life member of the American Ordnance Association, will be the honor guest of the Association at its Thirty-second Annual Meeting to be held at the Aberdeen Proving Ground, Md., Thursday, October 5, 1950. It is planned to broadcast Mr. Johnson's address via nationwide radio and television networks.

• Demonstrations and current tests of weapons and equipment will characterize the day-long program under the auspices of Maj. Gen. E. E. MacMorland, Commanding General at Aberdeen.

Reserve this date: Thursday, October 5, 1950, at Aberdeen Proving Ground, Md.

• The first Thursday in October has been the traditional meeting date of the Ordnance fraternity since the Ordnance Association was founded at Aberdeen in October 1919. It is the nationally famous meeting place of American industry and the armed services—Army, Navy, and Air Force. Complete details will be given later, but reserve the date now.

March 22, 1950. Charles L. Horn, president, Federal Cartridge Company, in the absence of Warren C. MacFarlane, president of the Post, presided.

Guests at the meeting included Brig. Gen. Joseph E. Nelson, Adjutant General, National Guard of Minnesota; Lieut. Col. A. R. Wood, Ordnance Department, U. S. Army, assistant professor of military science and tactics, University of Minnesota; Lieut. Col. Gerald Petroborg, Q.M.C., assistant senior Army instructor, Minnesota Military Area; Maj. Mark J. Gill, Q.M.C., assistant Army instructor; and Maj. Dudley Williams, Transportation Corps, assistant for Reserve affairs.

• **AT DAYTON**—The directors of the American Ordnance Association announce with deep satisfaction the appointment of Louis Polk, president of the Sheffield Corporation of Dayton, Ohio, to be general chairman of the Association's Technical Divisions and Committees assisting Harvey C. Knowles, vice-president of the Association, who is in charge of these important A.O.A. activities. The work of the Technical Divisions and Committees has expanded to such an extent that, at Mr. Knowles' request, Mr. Polk will assist in the conduct and administration of these projects.

Louis Polk

Mr. Polk has had a distinguished career in American industry. In addition to his chairmanship of the A.O.A. Gage Industry Division which he organized three years ago, he is president of the Sheffield Corporation of Dayton, Ohio, one of the leading producers of gages, semiautomatic and fully automatic gaging machines, precision measuring instruments, machine tools, contract manufacturing services, threading tools, tooling, thread chasers, die heads, and collapsible taps. He also heads the Threadwell Tap & Die Company, Greenfield, Mass. In addition he is chairman of the Sheffield Corporation of Australia Pty. Ltd., with plant and general offices at Melbourne. Mr. Polk is also chairman of the Gage Industry Division, American Ordnance Association, and president of the Cincinnati Post.

• **AT PORTLAND**—Under the inspiration of a group of Ordnance Reserve officers and leading industrialists of the area, the new Columbia River Post—newest A.O.A. Post on the Pacific Coast—is being organized. On December 12, 1949, fifty-eight Ordnance enthusiasts met in the Multnomah Hotel, Portland, Oreg., to add another pillar to the Nation's defense through industrial preparedness. Lieut. Col. Hubert R. Hopkins presided at the meeting which was attended by officers of the Army, Navy, and Air Force from near-by establishments. Also in attendance were several of the staff and many of the students who were enrolled in the economic-mobilization course of the Industrial College of the Armed Forces then being given in Portland.

The new Post has the required membership and formal presentation of its charter will be made soon.

The newly elected officers of the Columbia River Post are: W. P. Allyn, president; Haskell Carter, first vice-president; B. J. Beatty, second vice-president; A. F. McGarr, secretary; and Alex Grout, treasurer.

President Allyn's first appointment was a membership committee composed of the following: W. A. Gish, chairman; Mr. Grout, John Bergman, Gordon Tuppling, Hugh Marquis, Mr. Carter, and A. F. McGarr.

• **AT WATERVLIET**—Hiland G. Batcheller, chairman of the board of Allegheny Ludlum Steel Corporation, was installed last month as first president of the newly chartered Capital Cities Post of the American Ordnance Association. Harry L. Erlicher, vice-president of General Electric Company, Schenectady, and Sanford L. Cluett, vice-president of Cluett-Peabody & Company, Troy, were named first and second vice-presidents, respectively. Edward F. Webster of Watervliet Arsenal was elected secretary-treasurer. These officers were inducted at the inaugural meeting of the Post by Warren E. Hoffman, past chairman of the Capital Cities Chapter of the Empire Post, A.O.A., from which the new Post was formed. In his inaugural address Mr. Batcheller described some of his experiences as vice-chairman of the War Production Board in the late war and stressed the need for the industrial-preparedness activities of the Association.

The new Post got under way when its charter was presented by James L. Walsh, president of the Association, at a dinner-meeting held February 8, 1950, at the Circle Inn, Lathams, N.Y. Col. Harry N. Rising, commanding officer of the Watervliet Arsenal, and Col. Ledyard Cogswell, former chief of the Rochester Ordnance District, also were among the guests of honor.

• **AT CHARLESTON, S. C.**—Gen. Charles P. Summerall, famed soldier of World War I, former Chief of Staff of the Army, and president of the Military College of South Carolina—familiarly known as The Citadel—was the guest of honor at the dinner held on February 16, 1950, which served as the organizing meeting for the Citadel Post of the American Ordnance Association. Some sixty cadets of the institution, who form the nucleus of the soon-to-be-chartered Post, met at the Villa Marguerita in Charleston.

The principal speaker at the dinner-meeting was Col. Paul G. Paulsen, commanding officer of the Charleston Ordnance Depot. He discussed the part played by the American Ordnance Association in industrial-mobilization programs, and sketched the 1919-1950 history of the A.O.A. Brig. Gen. T. L. Futch, commandant of the Citadel cadets, was a guest of the group.

A telegram from James L. Walsh, A.O.A. president, was read anticipating the formal presentation of the new Post's charter. Maj. Giles D. Stephens, Ordnance Department, of the Citadel faculty, is leader of the group which is forming the new Ordnance Post.

• **AT LOS ANGELES**—The United States Navy Air Missile Test Center at Point Mugu, Calif., was the scene of a most interesting meeting of the Los Angeles Post on February 23, 1950. Led by their energetic president, J. D. Spalding, works manager, National Supply Company, Torrance, Calif., some 150 members

The Pittsburgh Post of the American Ordnance Association recently elected the following officers and directors:

President: **T. H. Eddy, treasurer, George A. Kelly Company.**

Vice-Presidents: **T. E. Millsop, president, Weirton Steel Company; J. K. B. Hare, vice-president, Westinghouse Electric Corporation.**

Secretary-Treasurer: **W. S. Rial, Jr., president, Morrison Rubber Company.**

Directors: **J. A. Appleton, vice-president, Pennsylvania Railroad; F. R. Denton, vice-chairman, Mellon National Bank & Trust Company; R. C. Downie, president, Peoples First National Bank & Trust Company; R. C. Enos, president, Standard Steel Spring Company; W. K. Fitch, chairman of the board, Dravo Corporation; K. C. Gardner, president, United Engineering & Foundry Company; H. A. Gidney, executive vice-president, Gulf Oil Corporation; H. B. Higgins, president, Pittsburgh Plate Glass Company; C. F. Hood, president, Carnegie-Illinois Steel Corporation; L. Iversen, president, Mesta Machine Company; G. H. Love, president, Pittsburgh Consolidation Coal Company; Ben Moreell, president and chairman of the board, Jones & Laughlin Steel Corporation; Brehon Somervell, president, Koppers Company; A. E. Walker, president, National Supply Company; I. W. Wilson, executive vice-president, Aluminum Company of America.**

of the Post made the all-day field trip via chartered buses.

At Point Mugu they were met by Capt. D. S. Fahrney, U.S.N., commandant, who outlined the day's program and told of the origin and scope of the test center and its work. A motion picture entitled "Missile Firings," was then shown. Capt. W. T. Hines, U.S.N., responsible for testing and evaluating guided missiles, spoke on the technical aspects of the missile problem. Capt. E. W. Parish, U.S.N., told of the maintenance and operation of the Navy's establishment for the study and development of this hyper-modern form of warfare. The group was then taken on a tour of the various assembly and firing installations.

The Post's membership committee, under the energetic chairmanship of Bill Wilson, is doing a bang-up job of keeping the local roster at full strength.

• **AT NEW ORLEANS**—Another new Post of the American Ordnance Association had its organization meeting at the Roosevelt Hotel, New Orleans, February 27, 1950. Maj. Gen. E. L. Ford, Chief of Ordnance of the Army, was the principal speaker at the luncheon which was attended by more than seventy members. The meeting was held in connection with the fourth annual Industry-Army Conference.

Temporary officers nominated by the organization committee are the following: N. L. Hawkins, New Orleans Equipment Company, president; R. L. Telford, Silas Mason Company, Shreveport, vice-president; R. A. Cuyler, Louisiana Power and Light Company, New Orleans; W. C. Nabors, W. C. Nabors Company, Mansfield, La.; E. A. Merklein, Moore & Merklein, Shreveport; J. E. Monroe, Boland Machine & Manufacturing Company, New Orleans; A. J. Higgins, Higgins, Inc., New Orleans; J. M. Guillory, New Orleans Public Service, Inc., New Orleans—directors; and Maj. E. P. Gizzi, New Orleans Port of Embarkation, secretary-treasurer.

• **AT WASHINGTON**—Rear Adm. F. E. Beatty, commandant of the Naval Ordnance Laboratory, White Oak, Md., welcomed a representative group of members of the Washington Post, February 28, 1950. The visit to the scene of so much of the scientific development work of the Bureau of Ordnance of the Navy was the fourth meeting of the Post's 1949-1950 season. After a noon luncheon, the group was conducted on a tour of the many activities of the laboratory.

The National Bureau of Standards and its Ordnance Development Laboratory were hosts to President Hobelmann's Ordnancemen on March 31st. The tour, which included demonstration of high-voltage scientific apparatus, Johansson gages, and interferometers, was highlighted by a lecture on nuclear physics and by a demonstration of the famed electron microscope.

Plans are under way for the annual meeting of the Post to be held in June, at which officers and directors for the ensuing year will be elected.

Albany Times-Union

H. G. Batcheller (left), first president of newly formed Capital Cities Post, receives charter from A.O.A. President James L. Walsh. Warren Hoffman (right), was president of former Capital Cities (Watervliet, N.Y.) Chapter of the Empire Post.

• **AT ABERDEEN PROVING GROUND**—Aberdeen Proving Ground Post on November 17, 1949, adopted a new constitution in line with that proposed by the national Association. While the present slate of officers will fill out the fiscal year, Col. T. K. Vincent, Thomas Shaughnessy, and Dr. Robert Kent were elected to fill vacancies on the Post's board of directors.

On March 2, 1950, Dr. R. W. Woods, professor emeritus of Johns Hopkins University, addressed a meeting of the Post on the subject of general laboratory facilities and test procedures. R. P. Witt, vice-president of the Post presided.

As the Proving Ground Post will be host at the Thirty-second Annual Meeting of the American Ordnance Association next October, most of the long-range plans look to the preparations for that notable event, and the Post again looks forward to entertaining the Ordnance-Industry fraternity. The Association was founded at Aberdeen in October 1919.

The Post held a dinner-meeting in the main cafeteria at the proving ground on Thursday evening, April 6th.

Dr. Charles F. Pickett, president of the Post, presided. Maj. Gen. E. E. MacMorland, commanding general at Aberdeen, addressed the group on "Ordnance Operations in the European Theater."

• **AT ANN ARBOR, MICH.**—University of Michigan Post, A.O.A., offers its student and faculty members a full and interesting program of activities during the college year. W. P. Hill, a leading industrial engineer, addressed the group on February 23, 1950, illustrating his talk on progressive methods of production with an appropriate film. On March 3rd, members of the Post made a field trip to the United States Rubber Company plant at Detroit. Maj. Gen. Stanley E. Reinhart, commander of the 65th Division, U.S. Army, during World War II, chose as the subject of his March 16th talk, "The need for American preparedness and the best means of attaining it."

Other scheduled activities include a lecture on modern gaging requirements of industry and the armed forces by a representative of the Sheffield Corporation, Dayton, Ohio; and a group visit to the Continental Motors Corporation, Detroit, viewing the latest developments in Ordnance-type engines and stress-analysis equipment. W. L. Cisler, executive vice-president, Detroit Edison Company, will address the final meeting on May 11th.

The officers of the Post are: R. E. Legate, president; John Lehoczky, vice-president; D. P. Kelly, secretary-treasurer; T. W. Daykin, corresponding secretary; Dean Joseph Bursley, Maj. Robert S. Niccolls, and Clinton Harris, directors; Maj. Wesley O. Moberg and Prof. R. Clay Porter, faculty advisers.

• **AT DES MOINES**—The Quad Cities-Iowa Post, A.O.A., and the Iowa Development Commission joined together in presenting American Ordnance Day, March 28, 1950, in connection with the Commission's week-long exposition of Iowa industry. Through the courtesy of Col. Charles D. Wiman, a national director of the Ordnance Association and president of Deere & Company, members and guests were invited to visit the Des Moines plant of that company.

Several busloads of Post members left the Kenwood Hotel at 9 A.M. for the visit to the Deere & Company plant where the morning was spent under the hospitable guidance of L. A. Murphy, vice-president of the company in charge of production, and Marvin Schmidt, works manager. At a luncheon meeting at the Kenwood, the group of several hundred Iowa industrialists was addressed by Col. W. W. Warner, commanding officer of Rock Island Arsenal, and Leo A. Codd, executive vice-president, American Ordnance Association. George A. Uhlmeyer, president of the Post, presided.

Following luncheon the members and guests visited the plants of Solar Aircraft Company, producers of stainless-steel products. The tour was under the auspices of Alexander Black, vice-president and resident manager.

• **AT LANCASTER**—The Industrial Mobilization Meeting of the Philadelphia Post, held at the famed plant of Hamilton Watch Company, Lancaster, Pa., on April 5th, was attended by military leaders from Washington led by Maj. Gen. E. L. Ford, Chief of Ordnance, U.S. Army; and by representatives of industry in the Philadelphia Post area led by Maj. Gen. G. M. Barnes, president of the Post and vice-president of the Budd Company.

R. M. Kant, president, Hamilton Watch Company, and George P. Luckey, vice-president of the company in charge of manufacturing, led the more than 400 members of the Post on an inspection trip through the Hamilton plant.

At dinner after the plant inspection, at which General Barnes presided, the following addresses were given: Mr. Luckey, "The American Watch Industry in National Defense"; Maj. Gen. Richard C. Coupland, Director of Armament, United States Air Force, "Industrial Support for Air Armament"; and General Ford, "The Rôle of the Ordnance Department of the Army in National Defense."

Mr. Luckey emphasized the importance of the American jeweled-watch industry to our national-defense potential.

"The facilities of the jeweled-watch industry," Mr. Luckey said, "should have a special interest to those concerned with the problems of defense. The jeweled-watch manufacturing industry is the only one that is familiar with the method of mass producing miniature parts to the required degree of accuracy and the only industry over the years that has developed and constructed equipment that will make these parts.

"Many of us in this industry would feel happier from the standpoint of national defense if the industry were several times larger. An industry such as the jeweled-watch industry can only grow and flourish in a favorable, peacetime atmosphere.

"At the present time the atmosphere for the growth . . . in this country is decidedly unfavorable. Destructive foreign competition in this industry is not a threat, it is an actuality. Not only was the entire civilian demand for watches turned over to Switzerland during the Second World War, but that country is naturally making every effort to hold the business gained during those war years."

• **ARTHUR ADELMAN**, nationally known as an ordnance engineer, died at Washington, D. C. February 19, 1950. A year before he had retired from active service in the Ordnance Department of the Army after forty-five years of outstanding service to the armed forces of the United States.

Mr. Adelman was born in Ohio and was graduated from Michigan State College in 1904. Immediately after graduation he entered the Office of the Chief of Ordnance of the Army where he spent his entire career. During the First World War he was outstanding for his broad knowledge, sound engineering techniques, and practical viewpoint concerning all phases of artillery ammunition, including propellants, explosives, metal components, and fuzes.

With the advent of the Second World War and the tremendous expansion of ordnance development and production programs "Pop" Adelman, as he became affectionately known among the thousands of military and industrial participants in ordnance operations, assumed a position in ordnance-industry councils which was as commanding as his quiet and unassuming manner was endearing.

In 1945 he was awarded the Army's Order of Merit medal and received a citation from the Secretary of War for exceptionally meritorious service to the United States for his work in the field of ammunition development and production during the Second World War. Upon the occasion of his retirement from active service in January 1949, he was tendered a reception at the Army-Navy Country Club, Washington, D. C.

He will be remembered with affection whenever the Ammunition Group of the Ordnance fraternity—including the Cut Back Club—assembles to honor those who, like himself, gave unsparingly of their talents for the advancement of the national defense.

• **COL. FRED H. WAGNER**, distinguished Ordnance Reserve officer of both World Wars, died at Baltimore, Md., March 23, 1950. He was a charter member of the American Ordnance Association and prior to the Second World War a frequent contributor to the pages of this magazine. Long an advocate of mechanization of armies, his writings on tanks and armored vehicles were widely read in this country and abroad.

A Baltimorean by birth, Colonel Wagner served for many years on the engineering staff of the Bartlett Hayward Company where his reputation as designer and builder of municipal gas holders and gas systems was early established. During the First World War he served in the Ordnance Department of the Army in positions of high responsibility in this country and overseas. He became commanding officer of the U.S. Nitrate Plant at Muscle Shoals, Ala.

In the Second World War Colonel Wagner again served in the Ordnance Department on the staff of Col. Calvin Goddard, chief of the Ordnance Historical Section. Colonel Wagner had many friends in engineering, industrial, and military circles, including the Ordnance Association, all of whom will remember his life and work with esteem, and those who knew him intimately, with affection also.

• **CHANDLER BREWER GARDINER**, ordnance research engineer at the Aberdeen Proving Ground and well known throughout the small-arms industry of the United States, died at the proving ground, March 20, 1950. He had been a member of the American Ordnance Association for many years and numbered hundreds of its members among his friends.

A graduate of Harvard University in 1916, Mr. Gardiner began his engineering career with Stone & Webster Engineering Company and subsequently with the Blackstown Valley Power Company. Later he joined the Taft-Peirce Manufacturing Company, Woonsocket, R. I.

In 1940 Mr. Gardiner joined Johnson Automatics Arms Company, remaining with that organization until he took up his engineering duties at the Aberdeen Proving Ground. During the First World War he served in the Signal Corps of the Army and later as a pursuit pilot in the Army Air Corps. He was a fighter pilot in the Air Corps in France in 1918.

"Chan" was identified with many professional, civic, and patriotic groups, including the Newcomen Society of England. He will be missed wherever his friends gather to carry forward the objects which were dear to his heart.

RED TAPE IN PROCUREMENT

THE EDITORS.—I have just read the March 1950 issue of THE COMMON DEFENSE (No. 113) and was struck by the discussion on page 3 concerning the red tape of Government procurement regulations. The subject is treated there as if the problem were something new. Actually it is a matter with which suppliers to the Government have struggled for a long time but are now finding increasingly troublesome. This is particularly true with the smaller firms making technical specialties which have to operate their organizations efficiently and cannot afford elaborate systems and records which are useless to them.

My company has supplied equipment to all branches of the armed services since before World War I. Accordingly, we have some background by which to gage the situation. We fully recognize that operations are bound to be wasteful and that there is bound to be duplication and pointless red tape in time of war. However, that should not be true in time of peace; yet it is. We were at first troubled, later annoyed, and most lately have been disgusted by the multiplication of useless, impractical, and unworkable regulations, rules, clauses, and requirements.

We have encountered case after case of irritating obstacles thrown into negotiations. Many of these obstacles serve no useful purpose whatever. Viewed from a common-sense business standpoint, they were plain foolishness. Yet they were carried out in all seriousness by the military, with attempts at enforcement by some subordinate who was not allowed to use his judgment—if he had any.

But not only did these regulations and rules throw stumbling blocks into negotiations with the Government—negotiations involving programs on which the security of this country may depend—but in addition they represented a wastage of taxpayers' money on useless duplication and nonproductive paper work.

If there ever was a time when this Nation needed to be militarily strong, it is now. And yet the military antagonize the very suppliers on whom they must depend with complicated regulations and a general philosophy that makes dealing with the Government a one-way street, where all exceptions and reservations are to the Government's benefit, and all risks and responsibilities must be borne by the supplier.

It is our feeling that the American Ordnance Association could make a valuable contribution to the common defense by hammering at the unwieldy, wasteful, irritating, and impeding restrictions and requirements which are involved in dealing with the military services.

There is a great deal of argument going on right now about economy in the armed services and the effects of appropriation cuts. Inasmuch as our organization makes technical equipment and has had contact with many military technical developments, we know the value of research and technology as applied to military problems, and we want to see every dollar that the military services can use wisely and efficiently appropriated for those purposes. We are willing to pay our taxes, both corporation and personal (and that means we are talking about the place where it really hurts!) for such purposes as long as the money is used wisely and efficiently.

But from long personal experience in acting as a vendor to the armed services it is our opinion that about thirty per cent of the entire man power of the armed forces could be entirely dispensed with, and, if the proper persons were chosen, the services would be more efficient and accomplish more than they do now. Such a lopping off of dead wood would not hinder operations but would merely remove the useless and nonproductive "paper pushers." The final result would be that the services would get their materials at lower costs, would get them quicker, and would have more suppliers to choose from.

There is not a private concern in the United States that is as difficult or as disagreeable to deal with as the United States Government. Is there any reason why this should be true? But as long as it is true, our military effort is going to cost more than it should, is going to move slower than it should, and is not going to accomplish what it might.

The three little paragraphs in the March issue of THE COMMON DEFENSE are only a beginning on the subject. We hope you will keep hammering at this topic until you finally reach the ears of the swivel-chair warriors who are even now dreaming up new regulations to make it more difficult and more distasteful for manufacturers to deal with their own Government, right in these critical times when the united effort of all the different groups in this country is necessary if our Nation is going to survive.

R. J. KRYTER
Indianapolis, Ind. *Esterline-Angus Company*

IN PRAISE OF "ORDNANCE TECHNOLOGY"

THE EDITORS.—Your "Ordnance Technology" section in the March-April 1950 issue of ORDNANCE was a big step in the right direction. In this fast-moving age of technical developments Ordnancemen need to be kept up to date on the many new methods and procedures that are continually coming to the fore.

At one time ORDNANCE was the outstanding source of new technical developments in the weapons field. While I realize that the recent war and a more general readership necessitated a broadening of the subject matter treated, I am glad to see that the Ordnance technician has not been forgotten after all. More power to you, and more "Technology."

ROBERT EMSWORTH
Baltimore, Md.

SECURITY AND THE MILITARY

THE EDITORS.—We note your remarks in the March 1950 issue of THE COMMON DEFENSE to the effect that it might be necessary to return all the atomic-energy weapon developments to strict military control. I am just wondering if this statement has been well thought out, due to the fact that news reports advise us there have been thirty thefts of important secret documents from our military personnel in Occupied Germany during the past several months.

It seems that some of our military personnel were taking secret documents to their homes, from which they are stolen. In one case a colonel left such documents in his automobile. The question naturally arises: How did the spies know the documents were in his automobile in the garage and not in his home?

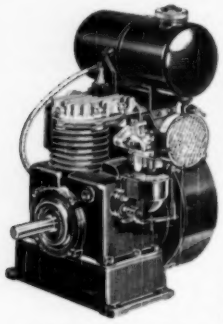
C. C. HAWKINS
Toledo, Ohio *Electric Auto-Lite Company*

"CLEAR, DIRECT, REALISTIC"

THE EDITORS.—I am taking this manner of conveying to you my sincere appreciation of the material that is published in ORDNANCE magazine and the method of presentation. It is clear, direct, and realistic in explaining the real meaning of industrial preparedness.

It is a distinct privilege on my part to be a member of an association whose primary purpose is that of scientific and industrial preparedness as one of our Nation's strongest guaranties of peace.

ALEXANDER BRESSLER
New York, N. Y.



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Atomic ENERGY

NEW URANIUM FIND

The Commissioner of Atomic Energy announced recently that France would become self-sufficient in atomic raw materials. The Commissioner said, however, that enthusiastic announcements to the effect that a new strike of uranium ores in central France would put her in first place among the atomic nations were "premature." He confirmed that a vein of pitchblende assaying at twenty per cent uranium had been found some fifteen miles from Limoges. Until this strike, the only uranium extracted from French soil had come from much poorer ores.

NEW ATOM SMASHERS

Particle accelerators or atom smashers are among the most important tools in nuclear research. The 184-inch cyclotron at the A.E.C.'s Radiation Laboratory, Berkeley, Calif., is at present the greatest of these machines. However, two Commission-financed accelerators now being designed and under construction will dwarf this huge machine.

At Brookhaven National Laboratory scientists are building a proton synchrotron (the cosmotron) which will impart energies of from two to three billion electron-volts to subatomic particles.

A still greater machine—the bevatron—is being built at the Berkeley Radiation Laboratory. A quarter-scale model of this enormous machine was built in record time to test the feasibility of the full-scale machine. Tests of the model have proved that the great machine will operate as planned, and construction is being pushed rapidly. Steel for the 10,000-ton ring-shaped magnet is being shipped, and the machine is expected to be ready for preliminary testing by mid-1950.

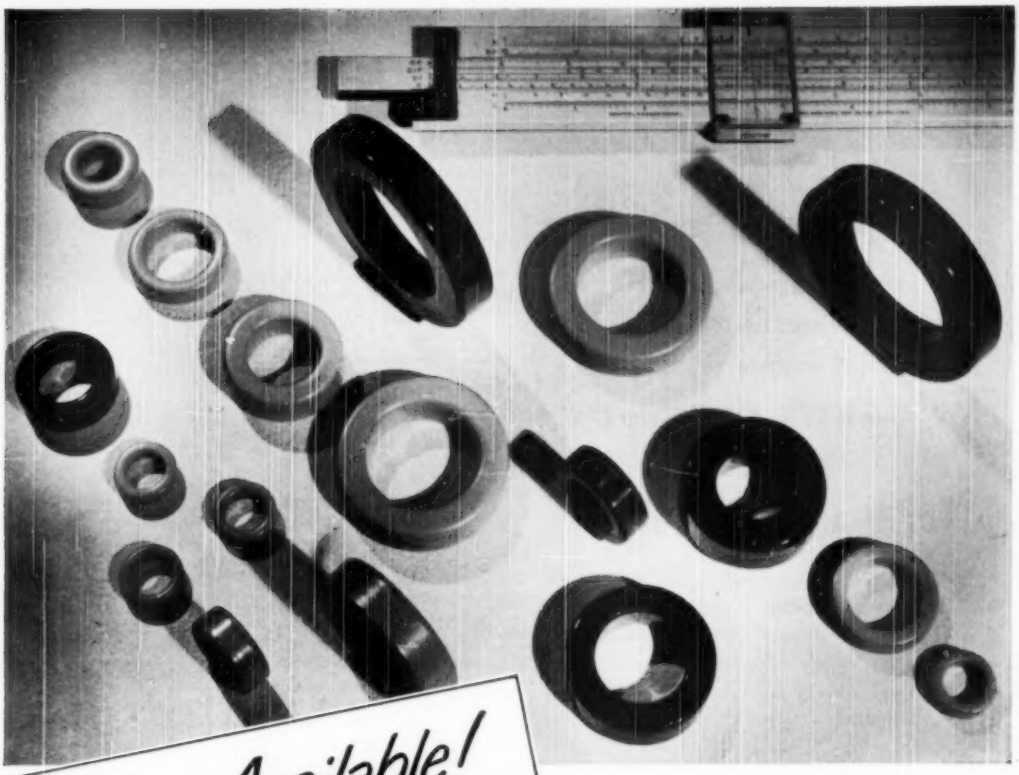
URANIUM FOR SALE

The United States Atomic Energy Commission has authorized the production of 200 pounds of uranium metal for use under A.E.C. license in non-Commission research projects in the United States. The metal will be specially produced and fabricated in the form of rods by the Mallinckrodt Chemical Works, St. Louis, Mo. It will be made available by Mallinckrodt through normal commercial chemical channels. The retail price will be approximately $50 a pound.

The material is being made available to assist and foster private research and development in the traditional manner by private institutions, according to the A.E.C. The uranium metal to be made available is highly refined by ordinary standards and will be valuable for metallurgical studies and other general research uses. However, it will not have the extreme purity required for nuclear reactors and certain specific types of atomic-energy research.

In accordance with provisions of the Atomic Energy Act of 1946, an A.E.C. license will be required of all purchasers of this uranium metal. The Commission established licensing regulations to conserve source materials on March 31, 1947. Under these regulations, licenses are granted in accordance with the following standards: (1) Assurance of the common defense and security; (2) Assurance of adequate source materials for production, research, and development; (3) Prevention of the use of source materials in a manner inconsistent with the national welfare; (4) Preservation of health and safety.

Inquiries about obtaining uranium for research purposes should be sent to the Licensing Division, Atomic Energy Commission, P.O. Box 30, Ansonia Station, New York 23, N.Y.



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Atomic Energy

NEW GASEOUS-DIFFUSION PLANT

With construction well under way on K-29, the third in a series of gaseous-diffusion units for production of uranium 235 in the Oak Ridge area, the Atomic Energy Commission announced recently that the Maxon Construction Company, Inc., of Dayton, Ohio, had been approved as construction contractor and Giffels & Vallet, Inc., of Detroit, as architect-engineer for the building of a fourth gaseous-diffusion unit, K-31, which will cost approximately $162,000,000. The Maxon Company and Giffels & Vallet already are engaged in the building of K-29, a $66,000,000 project. The Carbide and Carbon Chemicals Corporation, operator of the present gaseous-diffusion units, K-25 and K-27, is responsible for process development and process design for both K-29 and K-31 and for procurement of special production equipment and materials.

ELECTRONIC SELECTOR

A recently developed mechanical brain which will sift through the mass of scientific knowledge continually pouring from laboratories and select those facts needed for specific research jobs is being perfected jointly by the U. S. Department of Agriculture and the Atomic Energy Commission. The machine, called the rapid selector, promises to help solve a crucial scientific problem of keeping the individual scientist abreast of the tremendous surge of new ideas and developments in his own and related fields.

The selector operates like a research worker looking through the cards in a library catalogue, but at much greater speed. With properly coded entries, the machine will scan up to 120,000 subject entries per minute, compared with a dozen or two entries which a fast worker can examine in the same time. Moreover, it will reproduce, on the spot, an abstract of a document or, if properly set up, the original document, saving time now spent in searching shelves of local libraries or in waiting for the information to come from distant places.

URANIUM IN SOUTH AFRICA

At the invitation of the Government of the Union of South Africa, representatives of the United States Atomic Energy Commission and the Government of the United Kingdom recently discussed with the South African Atomic Energy Board problems relating to the production of uranium in the Union of South Africa. The discussions, which were held in Johannesburg, South Africa, are a continuation of previous conferences among the technical representatives of the three Governments which have occurred over a period of years.

MARINE ATOMIC PROPULSION

The Argonne National Laboratory and the Westinghouse Electric Corporation are engaged in the development of a land-based prototype of a reactor suitable for ship propulsion.

Although this reactor will be built at the Nuclear Reactor Testing Station in Idaho, engineering and development work is being carried on at Argonne and in the new laboratory of the Westinghouse Atomic Power Division.

Research and development work is well advanced, and detailed engineering design of the ship-propulsion reactor is scheduled to begin in about a year. Construction should be under way by 1952.

Although cost estimates cannot be made until detailed design specifications have been completed, it is expected that the reactor will cost at least $25,000,000, and perhaps substantially more, depending upon the solutions found possible for the technical problems encountered.

The ship-propulsion reactor will be a single-purpose machine designed specifically to produce large amounts of heat under conditions that will permit conversion to power for propulsion of naval vessels.

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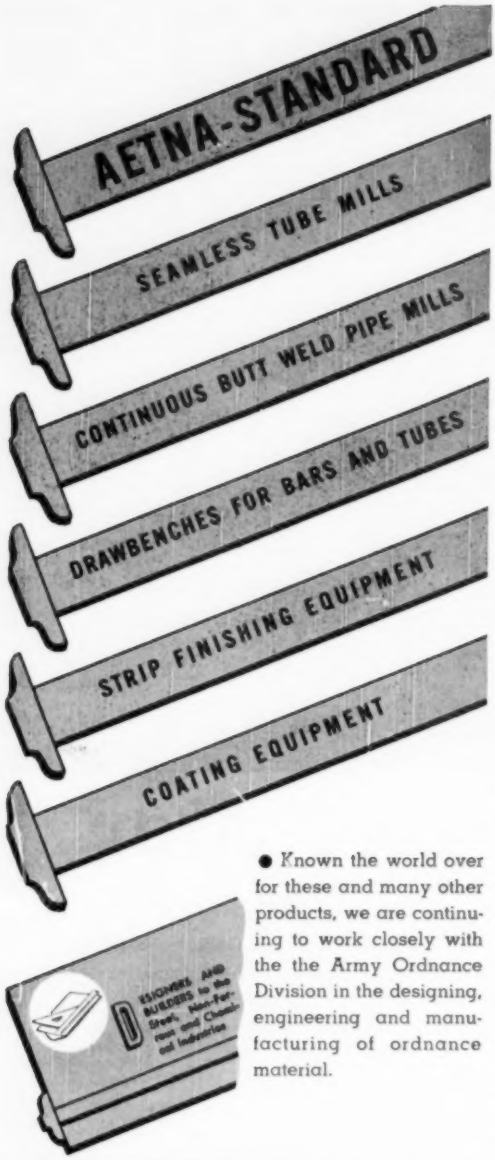

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THE RESERVES

IMPROVED RESERVE PROGRAM

The Army will institute a modification of the present Organized Reserve Corps program which will result in material improvement in the efficiency and readiness of the Reserve. It will take about three months to accomplish necessary steps incident to establishment of the program.

Summarized briefly, the new organization will set up an Active Reserve, an Inactive Reserve, and an Honorary Reserve. The Active Reserve in turn will include an Organized Reserve and a Volunteer Reserve. The Organized Reserve will be made up of personnel in units needed for mobilization, plus those individuals needed upon mobilization to augment the Regular Army units and staff agencies.

The Volunteer Reserve will consist of individual officers and enlisted men needed for expansion of the Army of the United States in event of emergency. This group initially will include currently organized training units. The Honorary Reserve will be made up of personnel of long service who request such assignment. The Inactive Reserve will consist of personnel who cannot or do not desire to participate in the Active Reserve, but who will be subject to call in case of emergency despite their inactive status.

COAST GUARD RESERVE

Defense Secretary Louis Johnson recently urged that a House Appropriations Subcommittee act favorably on the President's recommendation that $4,100,000 be appropriated for the Coast Guard Reserve in fiscal 1951.

Secretary Johnson's endorsement of the Coast Guard Reserve program was made in a letter to Treasury Secretary John Snyder which was included in the record of the January 11th hearings. It read, in part, as follows:

"I desire to go on record as fully concurring with the request for the necessary funds for this purpose. While many of the wartime purposes of the Coast Guard are but large-scale expansions of its peacetime functions . . . I am particularly perturbed about the security of our ports in the event of an emergency. It is vital to national defense that a modest but highly trained force be in being to detect sabotage, supervise explosives loading, prevent waterfront fires and explosions, control the identity of waterfront personnel, etc. I wish to emphasize that, in my opinion, the maximum need for this protection will be immediate upon the declara- of an emergency."

Another controversial point regarding the Coast Guard Reserve—legal authority—was cleared up by Vice Adm. Merlin O'Neil, Coast Guard Commandant, who testified as follows:

"It should be emphasized that the Coast Guard Reserve is authorized by act of Congress and was authorized before World War II. Further, Congress has reaffirmed that authorization in enacting Title 14 in the last session of Congress through the enactment of Public Law 207."

CIVILIAN COMPONENTS DIVISION

A Civilian Components Division of the Army Field Forces staff at Fort Monroe, Va., has been established to supervise the training of the National Guard, the Organized Reserve Corps, and the Reserve Officers' Training Corps. Formation of the new division consolidates all civilian-component training under one head. Within it are separate branches for National Guard, Organized Reserve Corps, and Reserve Officers' Training Corps affairs. Officers of these branches will be selected for wide experience, both

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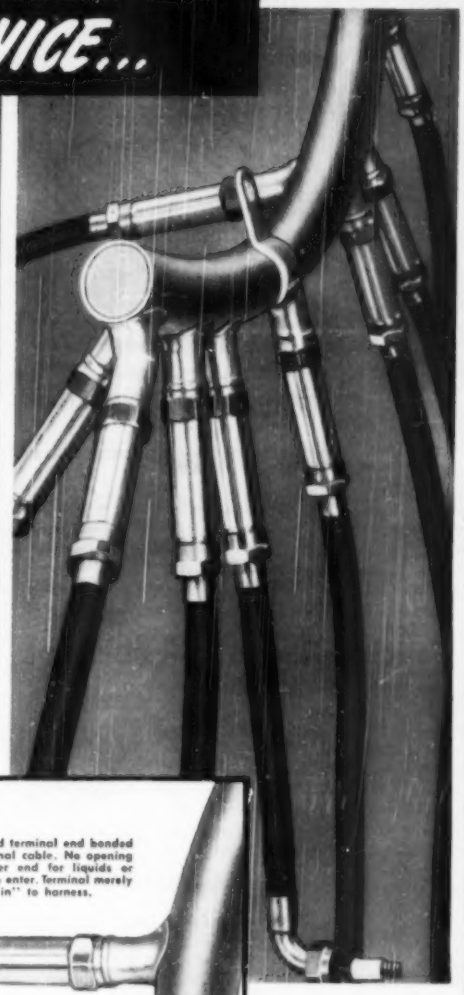

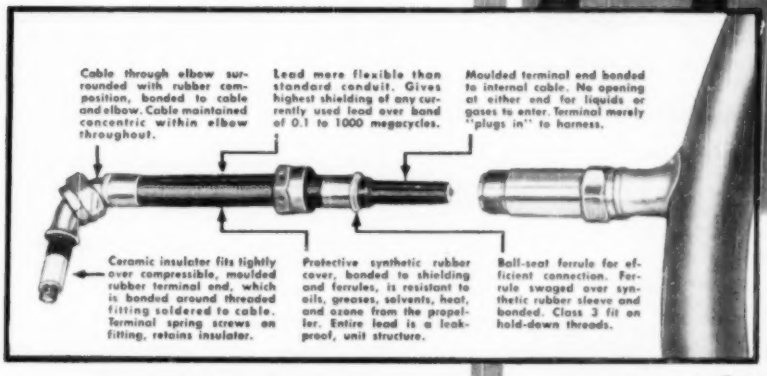
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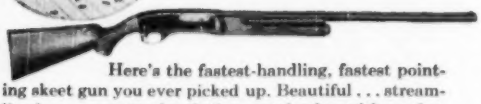

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The Reserves

in peacetime training and in combat, and for intimate working knowledge of their respective components. The National Guard and Organized Reserve Corps sections will each be headed by officers of those respective components.

LOGISTICAL TRAINING

The third logistical training exercise will be held in May at Fort Belvoir, Va. Called "Log Ex 50," this exercise will last about one week, will have for the first time the participation of the administrative services, and will employ from 1,500 to 2,000 persons. Planning requires Reserve officers of all grades to be called to active duty for periods of two weeks to ninety days. Type of services desired: Writing the problem, planning administration, actual conduct of the exercise, and, to a limited extent, participation as players. Interested officers should write through O.R.C. channels to the Maneuver Director of Logistical Exercise, Fort Belvoir, Va. State length of active-duty tour desired and enclose a statement of service including present Reserve assignment.

BOMBERS FOR NAVY RESERVE

Eighty-two Martin AM-1 Maulers, the U. S. Navy's largest dive-torpedo bombers, are being turned over to six units of the Naval Air Reserve to improve the Reserve training program by inclusion of the most modern military aircraft in the flying schedule.

The Reserve units to receive the Maulers are located at Atlanta, Ga.; Glenview, Ill.; St. Louis, Mo.; Grosse Ile, Mich.; Floyd Bennett Field, N. Y.; and Squantum, Mass. The Reserves train at the Naval Air Stations in their respective cities. Deliveries to the Reserve squadrons are either now being made or will be in the near future.

INDUSTRIAL RELATIONS PROGRAM

The Navy has authorized the activation of a Volunteer Reserve Industrial Relations Program. The program is sponsored by the Office of Industrial Relations, headed by Rear Adm. Wesley M. Hague. It is under the immediate supervision of Lieut. Comdr. Walter Faley.

According to Capt. John Shultz, Assistant Chief of Personnel for Reserves, the Industrial Relations Program will be organized in the form of Volunteer Units. No limitation has been placed on the size of each unit, but the entire program is not to exceed 1,000 officers.

The composition of Industrial Relations Units will include male and female officers who have had active service under the cognizance of the O.I.R., plus specialists in such industrial-relations fields as personnel management, labor relations, safety engineering, employment, and training.

Whenever funds are available, active duty for training, with pay, will be authorized for Industrial Relations Specialists at such major activities as naval shipyards, air stations, ordnance depots, and supply depots.

RETIRED PAY RATES

Service persons who retire while drawing total compensation of September 30, 1949, under saved-pay clauses of the pay act will draw retired pay at the rates provided in the new law.

The question posed as a result of the recent pay instructions stated that a person discharged—as distinguished from retired—while drawing pay and allowances at the old rates cannot be paid for accrued leave at the new rates.

The reasoning on the discharged category was that these persons enjoyed protection of the lesser pay but greater allowances of the old law for the longest possible time and should not therefore, when increased basic pay was at issue, pick up the new rates during final leave.

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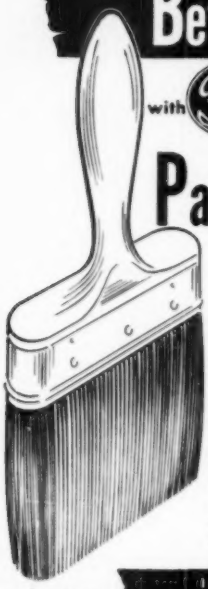

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Book REVIEWS

Review Staff

BRIG. GEN. DONALD ARMSTRONG, *military historian, lecturer, author, manufacturer, Burlington, N. J.*

COL. GEORGE S. BRADY, *consulting engineer, author, editor, Washington, D. C.*

F. W. FOSTER GLEASON, *military historian, ordnance analyst, editor, Washington, D. C.*

COL. PHILIP SCHWARTZ, *author, air ordnance expert, Headquarters, United States Air Force, Washington, D. C.*

LIEUT. COL. CALVIN GODDARD, *small-arms authority, Tokyo, Japan.*

LIEUT. COL. MELVIN M. JOHNSON, JR., *automatic arms expert, inventor, author, New Haven, Conn.*

BRIG. GEN. R. H. SOMERS, *engineer, author, editor, Dover, N. H.*

COL. THOMAS K. VINCENT, *artillerist, engineer, author, Aberdeen Proving Ground, Md.*

DR. JOHN J. O'CONNOR, *educator, author, editor, Washington, D. C.*

LIEUT. COL. JOHN J. DRISCOLL, *author, air armament engineer, air combat officer, Headquarters, United States Air Force, Washington, D. C.*

The Red Army Today. By Louis B. Ely. Harrisburg, Pa.: Military Service Publishing Company. 256 pp. $3.50.

BECAUSE newspapers are full of information concerning the "cold war" and because radio commentators talk continually about diplomatic troubles with Russia, it would appear to be exhibiting only a minimum of common sense for those who have any relationship to the military forces of the United States to show some little curiosity about the Soviet fighting forces.

Here is a book which attempts to describe the Russian Army. Its author has had a great deal of experience in Army Intelligence and has been in the United States Regular Army since 1919. He should be able to do a fair job of presenting the known facts concerning the Soviet forces. However, in reading this book, it is frequently difficult to tell which of his paragraphs contain facts and which are based on imagination.

To cap it all, two of his last chapters are devoted to imaginary details of a World War III in which the Russians are licked, so that after reading the book we may go to sleep with the expectation that we will all live happily ever after because right and justice as usual have triumphed over wrong and injustice.

Notwithstanding the use of imagination, there appear to be enough facts in the book to make it worth reading. Colonel Ely compares the capabilities of the personnel, equipment, and methods of the Russian Army with those of the U. S. Army. The author stresses the fact that the Russians depend more on masses of artillery than do other nations. Artillery ammunition and gasoline in large quantities furnished the principal headaches in transportation during the recent unpleasantness. The Russians developed outstanding tanks in World War II, but their tank-maintenance problems were more troublesome than ours because Russian soldiers do not have the mechanical background or the initiative of the average American soldier. Food transportation was less important to the Russian Army than to ours because the Russians tried to live off the country and were accustomed to a lower standard of living. *(Continued on p. 418)*

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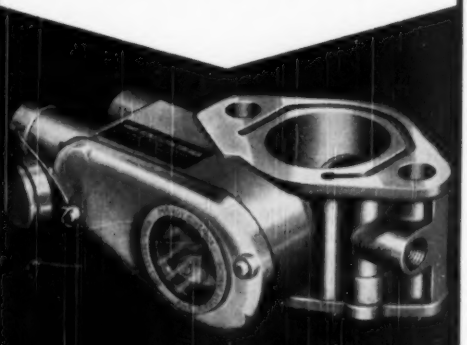

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Brake maintenance	29.2%
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Book Reviews

"Briefly reviewed, an initial survey of the organization of the Red Army shows a startlingly large number of peacetime combat divisions, a high proportion of artillery, a policy of command of air units by ground commanders, and a high ratio of weapons compared to personnel . . . The Red Army persists in emphasis on light guns . . . has acquired a liking for mortars . . . exhibits a marked proclivity for placing artillery pieces in direct-fire positions [and has] a large number of heavily armored self-propelled guns . . . [It] includes a considerably higher proportion of rockets than is found in the Western armies."

Military schools should use this book or its equivalent as a textbook, and Reserve and Regular personnel would do well to read it.—PHILIP SCHWARTZ.

Disaster Through Air Power. By Marshall Andrews. New York: Rinehart & Company. 143 pp. $2.

"'DISASTER THROUGH AIR POWER' is an angry book. It is a coldly angry book"—so reads the publisher's comment on the jacket. It might have been more appropriate to have stated that this book was written by an angry author, for Marshall Andrews evidently rushed this to press without giving his text the advantage of the cool-headed, unbiased editing such a treatise warrants. The author's friend, S. L. A. Marshall, who wrote the 10-page laudatory introduction, states that due to the "urgency" of publication "time did not avail me to read it in its entirety." A few hours devoted to a careful prepublication review could have eliminated some of the many obvious inaccuracies, especially with regard to organizations and matters with which the author had no direct contact.

Marshall Andrews' prejudiced viewpoint is not only admitted in the preface but is very evident in his "historical" analyses. In an effort to prove the danger of what he misinterprets as Air Force dependence on a single weapon, the B-36, he cites the "cause" of the loss of the Franco-Prussian War. According to Andrews, Napoleon III lost this war with "incredible speed largely because of his reliance on the mitrailleuse."

Any historical analysis of this war should, of course, include the fact that it was actually dependence upon *another* "new weapon," the Prussian breech-loading rifled gun, to which credit belongs for being the decisive factor in the war. This new Krupp breechloader was opposed by its obsolescent French counterpart, the bronze muzzle-loading cannon. The Prussians fully exploited the potential increase in firepower, which was amplified by a new concept of mass tactics, and were able to gain decisions without closing to "conventional" ranges. The French mitrailleuse, on the other hand, was anchored to obsolescent tactical patterns, and thus it proved to be ineffective in combat for this reason.

Though obviously of a biased nature, it is apparent that many of the author's statements are the result of lack of first-hand knowledge and not prompted by any malicious intent. Many of his analyses of the capabilities of air power are quite clearly based upon obsolete concepts.—J. J. DRISCOLL.

My Three Years in Moscow. By Lieut. Gen. Walter Bedell Smith. Philadelphia: J. B. Lippincott Company. 346 pp. $3.75.

AMERICAN-SOVIET relations have been the theme of hundreds of books through these years of the cold war. A great many were written by men who had opportunity to know the truth, but compared to the vastness and importance of the subject, the positive and reliable facts are all too few. General Smith is the first envoy of the United States to the Union of Socialist Soviet Republics who has rendered a full and free account to his countrymen.

He went to Moscow in March 1946 as an envoy, but he acted

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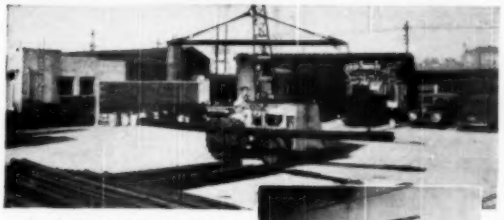

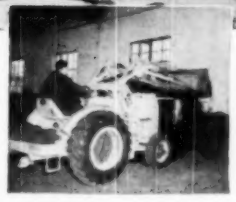

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Finish 22.02, Class C	"Granodine" (Dip, Spray, and Brush Grades)
U. S. A. 57-0-2	
Type II, Class A	"Thermoil-Granodine"
Type II, Class B	"Permadine"
Type II, Class C	"Granodine" (Dip, Spray, and Brush grades)
U. S. A. 72-53	(See AN-F-20)
JAN-C-490, Grade I	"Granodine" (Dip, Spray, and Brush grades)
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AN-C-170	"Alodine"
AN-F-20	"Alodine"
	"Granodine" (Dip, Spray, and Brush grades)
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	"Permadine"
	"Thermoil-Granodine"
	"Zinodine"
	(See also U. S. A. 3-213)
AXS-1245	(See JAN-C-490)
Navy Aeronautical M-364	"Permadine"
	"Thermoil-Granodine"
U. S. N. Appendix 6	"Lithoform"

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Type 5	"Deoxidine" Nos. 170, 171, 670
U. S. A. 3-213	
Type I	"Deoxidine" (Wash-off grades)
Type II	"Deoxidine" (Wipe-off grades)

Metal Cleaning Chemicals

SPECIFICATION NUMBER	ACP SPECIFICATION CHEMICAL
JAN-C-490, Grade II	
Type 2	"Ridoline"
Type 6	"Ridosol"
U. S. A. 3-192	"Ridoline" No. 3192
U. S. N. Appendix 6	"Deoxidine"

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as a soldier, and as a soldier he writes this report. His bluntness worked well with the Reds to whom all else spells indecision and weakness.

It is to be hoped that his blunt report will work equally as well on the American people who are little used to the presentation of simple, straightforward facts by our Government leaders.

Forewarned by his experience with the Reds in Germany, he took little for granted in the Soviet capital. He made his own decisions, but, as in Army work, he relied on his well-trained staff for all details. Smith sees the greatest danger to peace in the incredible ignorance of the people of the Soviet Union and of their leaders. Perhaps the chapter devoted to the evaluation of Stalin and his lieutenants is the heart of the book, for it is based on personal contact and simple fact. Indeed, the volume reads much like an intelligence report. It is not light reading, but it is a volume which no American should miss.

—F. W. Foster Gleason.

Patent Tactics and Law. By Roger Sherman Hoar. New York: The Ronald Press Company. 352 pp. $7.

THIS is a new, completely revised third edition of Colonel Hoar's timely, dependable guide to airtight patent protection. As in the case of the earlier editions, the volume will help business executives, industrial engineers, inventors, and patent attorneys to steer a clear, trouble-free course in all patent matters.

Colonel Hoar is commercial attorney of Bucyrus-Erie Company, South Milwaukee, Wis. He is a member of the Massachusetts, Wisconsin, Federal, and Patent Office Bars and is a former Assistant Attorney General of Massachusetts. He is also the author of "Constitutional Conventions," "Conditional Sales," and "Wisconsin Unemployment Insurance."

In addition, Colonel Hoar is a charter member of the American Ordnance Association and of the Milwaukee Post, A.O.A. He served with distinction in the field of ballistics as an officer of the Ordnance Department of the Army in the First World War. Having these eminent qualifications, plus the ability to write clearly and convincingly, little wonder that "Patent Tactics and Law" appears in a third edition. It will merit successive editions to meet a growing demand.—L.A.C.

Thirteen Who Fled. Edited by Louis Fischer. New York: Harper & Brothers. 244 pp. $3.

LENIN once said that the Czar's soldiers voted for peace with their legs—they walked out of World War I trenches and went home. In the same way a considerable number of Hitler's Russian prisoners and slaves voted against Stalin by choos-

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ing not to go home. Even the ruined, rubbled, ragged, hungry Europe of 1945 seemed to offer a brighter prospect of liberties and groceries than Soviet Russia.

It occurred to Mr. Fischer that these thousands of Russian displaced persons possessed valuable information on Soviet conditions and methods. He interviewed many of them and ultimately persuaded thirteen to write brief autobiographies.

The unanimous testimony of the thirteen is that it is impossible to enjoy a normal human existence in an atmosphere of terror, tension, suspicion, betrayal, and murder. An officer in the Red Army decided that "Soviet citizens give too much and get too little." A peasant protested that in Russia he had not been allowed to be a peasant. A victim of collectivization, he dreamed of "having a little farm of my own, my own pigs, my own cow."

Some accounts testify to the survival of religious feeling; none reveal any semblance of a hostile underground. Soviet education and Soviet life put a premium on cynical resignation to terroristic compulsion.—JOHN J. O'CONNOR.

Hood: Cavalier General. By Richard O'Connor. New York: Prentice-Hall, Inc. 316 pp. $4.

THE author of "Thomas: Rock of Chickamauga" has come up with a most unusual biography of a hitherto untreated leader of the Confederacy—the colorful, dynamic, indomitable John Bell Hood.

O'Connor has dealt with Hood in a greatly sympathetic and noncritical vein, highlighting his personality, military ability, and his great moral and physical courage. Certainly, of all the Confederate generals, Hood is one of the few who personified the Southern cavalier ideal of a soldier and hero to the ultimate degree.

Tall, blond, and dashing, Hood went from first lieutenant to major general in two years, a phenomenal rise, and, following his successes, was lionized by Richmond society during the glorious early days of victory. But the later years of defeat were bitter and lonely for him, with an arm smashed and paralyzed at Gettysburg and a leg lost at Chickamauga.

Still, strapped in his saddle, he fought hard to the end, being the last of the Confederate generals to surrender, a fugitive in the canebrakes of Louisiana long after Appomattox.

The book stands as a literary work that needed doing, and O'Connor has done it well.

It will prove of lasting interest to all Americans who admire the military virtues of courage and valor in the defense of a cause that is deemed to be just. John Bell Hood displayed these virtues in full measure.—R. P. HINES.

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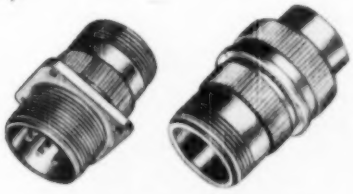

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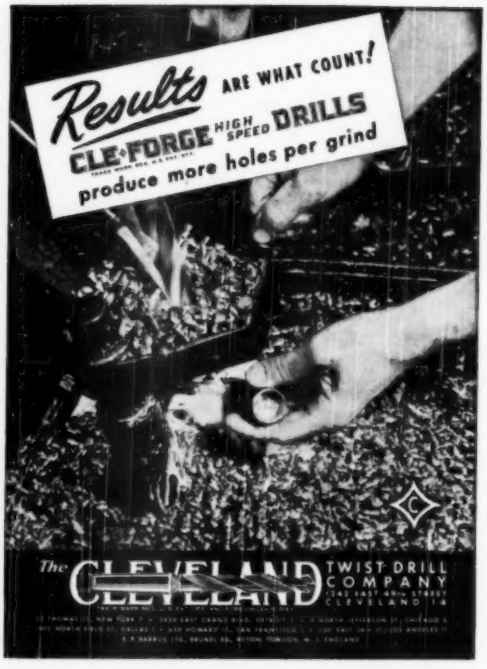

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The problems General Clay faced as Deputy and Military Governor of Germany for the four years after the war. Retail $4.50. To members $4.05.

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General Howley was U.S. Military Commandant in Berlin. Here is the story of his 4-year battle of wits with the Russians. Retail $3.50. To members $3.15.

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By Marshall Andrews

A thought-provoking argument against America's overemphasis of air power. Retail $2.00. To members $1.80.

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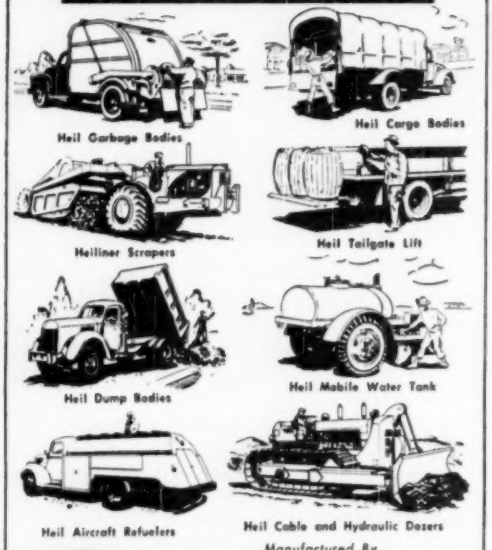

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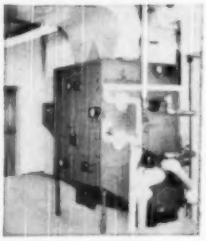

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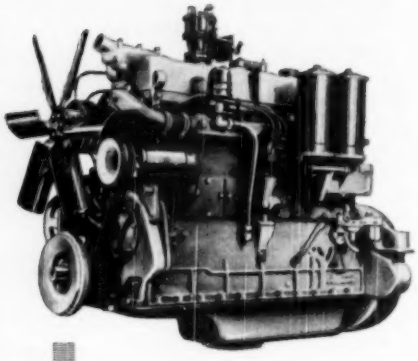

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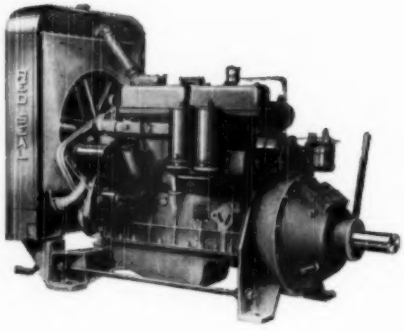

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ARMAMENT TECHNOLOGY

In this section of ORDNANCE *are published articles on ordnance research, development, manufacture, and related subjects of a more detailed and technical nature than those generally appearing elsewhere in this magazine. Also included are studies on Ordnance service in the field forces, logistics, and allied phases of field operations. Ordnancemen will thus find assembled in convenient "package" form information which should prove of especial value to them.*—THE EDITORS.

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Ordnance in the Arctic

Lubricating Oil Must Flow at Subzero Temperatures

by

Col. H. J. Conway

Adequate lubrication of weapons and vehicles is a vital element in our northern defenses

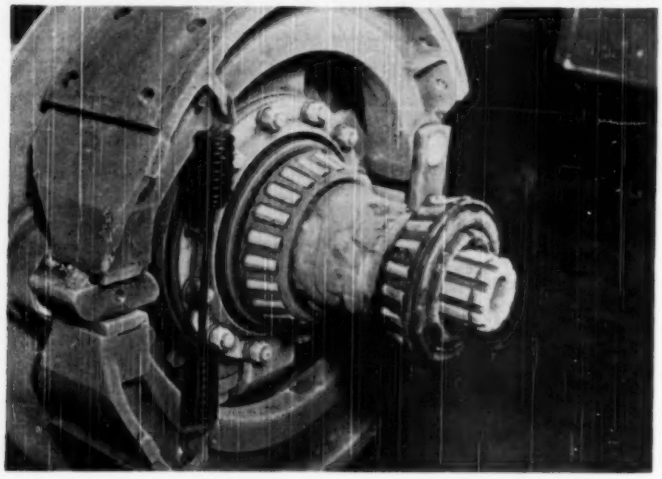
EFFECTIVE firepower plus workable transportation—that is, the ability of arctic arms and ammunition to reach defensive positions quickly and to operate effectively in order to repel the invader—will be the key to the successful defense of Alaska.

This is the conclusion of the author who, during the years 1946-1949, was directly connected not only with the development of arctic ordnance items as Alaska Theater Ordnance Officer but also with their use as Commanding Officer of Troops of the Alaska General Depot. The Alaska General Depot troops at Anchorage, Adak, and Kodiak not only had a supply and maintenance mission, but due to the shortage of combat troops they were used for ground defense of the Alaskan air bases where they were stationed.

War in Alaska will most probably come as a surprise attack by numerically greater troops delivered directly on the air bases. This attack will come in the

Experts discuss arctic testing at Ladd Field, Alaska, 1948. Left to right: M. Sgt. Adam Asmen, cold-weather specialist; Harry A. Collins, chief engineer, General Motors research division; Colonel Conway, the author; and Capt. William C. Klein, Ordnance technical expert (U. S. Army photograph).

Colonel Conway assumed the chairmanship of the Armed Services Explosives Safety Board, Munitions Board, Office of the Secretary of Defense, last April upon his return from an inspection of explosives-storage installations in the Caribbean area. He was formerly commanding officer of the Alaska General Depot and Alaskan Theater Ordnance Officer.



Frozen wheel-bearing grease was a major arctic lubrication problem.

winter as the tundra around the key air bases is practically impassable in the summer. The probable superiority of attacking forces plus a one-way ticket for the airborne invading troops dictates that this attack must be broken up quickly before the attackers can organize successfully after hitting the ground. This attack can only be stopped by effective mobile firepower which means ordnance equipment capable of operating quickly and effectively under subzero conditions.

Alaskan Army, Navy, and Air defense forces will naturally expand rapidly, after the initial airborne attack is reported, to the point where the present logistical support, particularly of maintenance and supply housing facilities, will be overtaxed. Arms and equipment must, therefore, not only work quickly, but they must be simple to supply and maintain in combat with the minimum of logistical support.

Simplicity Needed

Based on three winters' experience with arctic operations, it is the author's belief that great stress must be given to making this arctic ordnance simple in design, operation, and maintenance. It must be capable of being used successfully by semitrained troops burdened by heavy clothing and further handicapped by the fact that their efficiency to operate this arctic equipment effectively decreases with the temperature. Survival in cold climates demands a great deal of a person's energy, leaving less for effective combat.

Wheeled transportation as well as armament that will operate under frigid conditions is the key to military survival in the arctic through the ability to mobilize forces quickly in the defense of air bases.

In the winter of 1946-1947, where extremely low temperatures of minus 55 to 62 degrees Fahrenheit were experienced at our key bases, aircraft upon which Alaskan defenses so vitally depended did not fly because landing wheels would not turn over. Fueling operations for heating buildings as well as for the use of aircraft were especially affected. The supply of food and clothing was seriously curtailed. All activities were paralyzed by the lack of suitable transportation.

As a direct result of the unsatisfactory operation of equipment under such conditions (plus the experience of the Army Ground Forces in testing arctic ordnance equipment under cold wet conditions during Task Force Williwaw in the Aleutians and during Task Force Frigid under cold dry conditions in the north central Alaska area), military characteristics were set up. These characteristics prescribed that all equipment should function satisfactorily through a temperature range of plus 125 degrees Fahrenheit to minus 65 degrees Fahrenheit. Prior to this time, minus 40 degrees Fahrenheit was the lower limit.

One of the main difficulties encountered in the unsatisfactory operation of equipment was that fuels and lubricants were unsuitable below minus 40 degrees Fahrenheit. Mobility in the arctic is dependent on satisfactory performance of fuels and lubricants in military vehicles.

Divergent Qualities

If the engine oil is not light enough to flow freely, the engine cannot be cranked fast enough to start. Once started, the engine soon reaches normal operating temperatures. Therefore, the oil must also be heavy enough to lubricate the engine for prolonged periods.

Grease is also a most important item. Wheel bearings and steering knuckles will freeze solid at low temperatures if improper grease is used.

Time was the principal element in this development in 1947. The Berlin cold war was beginning to develop. Our troops in Alaska carried arms at all times and were prepared for airborne

The subzero operation of automatic weapons requires special greases.

assault. The biggest improvement in the arctic equipment in the shortest period of time could be achieved by the improvement of the low-temperature characteristics of the existing fuels and lubricants. The Ordnance Department of the Army then rapidly embarked on an intensive development program. Competent know-how was recruited through means of the Coördinating Research Council, an organization jointly sponsored by the American Petroleum Institute and the Society of Automotive Engineers.

The petroleum and automotive industries coöperated fully in attacking this fuel and lubrication problem. The Air Force participated by allowing the use of the Eglin Field climatic hangar. Within a period of only a few months, lubricants were being tested in vehicles in the test hangar where temperatures from zero to minus 65 degrees Fahrenheit were reproduced. As a result of these tests the best lubricating oil and grease were selected for field test. These were service-tested at Fort Churchill, Canada, in the Hudson Bay district and in Alaska in the winter of 1947-1948.

Industrial technical personnel from the foremost oil and automotive firms as well as from the Army went to Alaska and worked with the troops in the cold in order to follow these tests closely. There were great improvements, but the problem of eliminating the shortcomings in both greases and lubricating oils was not completely solved. Consumption rate of the arctic engine oil was exceedingly high. Too many man-hours were required in limited facilities to remove completely the heavy grease normally used and to replace it with the new arctic grease.

"Global Grease"

In order to eliminate this time-consuming winterization, an effort was made to develop a global-type grease which could be used equally as well for both winter and summer operations at all temperatures. The laboratory work was completed in the spring of 1948. In order to test five of the most promising greases, "Operation Greaseball" was organized.

The equipment used on Operation Greaseball consisted of two ¾-ton and fourteen 2½-ton trucks. The convoy left Aberdeen Proving Ground, Md., in August 1948 and proceeded across country to the Mojave Desert. Temperatures were encountered as high as 124 degrees Fahrenheit. After 3,000 miles of both on- and off-road operation, the convoy proceeded to Benicia Arsenal, Calif., for inspection.

Engine Oils Changed

Immediately following this, the convoy went to Mount Rainier Depot, Tacoma, Wash., where the engine oils were changed to a newly developed engine oil, REO 28. The trucks then continued to Great Falls over the Alcan Highway to Fairbanks, Alaska.

The fleet hauled freight throughout the winter in the general area south of Fairbanks amassing a fleet total of some 120,000 test miles. Temperatures were encountered as low as minus 67 degrees Fahrenheit. The convoy returned to Aberdeen in May 1949.

As a result of this operation, a satisfactory global grease and an improved arctic engine oil were obtained. Although incidental to the operation, improved synthetic arctic tires, both large (above 9:00-inch) and small, were tested. The small-size tires showed little wear after approximately 23,000 miles of operation. The large-size tires that contained the new arctic polymers were installed enroute to Alaska at Mount Rainier and Great Falls. These tires wore extremely well.

It was generally concluded that the tire problem was at least partially answered. More testing will be required of the large-size tires for positive conclusions. In addition, arctic fuels, brake and hydraulic fluids, antifreeze, winterization kits, batteries, paints, electrical components, and van-type bodies for the Transportation Corps were tested.

Further development has been effected on lubricating oil. The latest developed oil, REO 72, has a consumption rate comparable to SAE 10 according to recent tests completed at Aberdeen Proving Ground. This oil was tested only at Big Delta, Alaska, this winter as sufficient quantities of the new oil were not available in time for general issue to the Alaskan theater or for use in Operation Sweetbriar.

Ordnance Accomplishments

In a brief summarization of Ordnance accomplishments to date we find that a fine job has been done on tires, fuels, and lubricants. Batteries and winterization kits are being improved. The problem of more effective arms and ammunition, which is usually subordinated in peacetime to the wheeled problem, is being given serious attention. A low-unit-pressure vehicle for arctic cross-country use capable of operating over the tundra and snow is now in the advanced stages of development. Guided missiles with liquid and solid propellants as well as other new weapons are being designed for arctic use. Above all, this ordnance will be capable of being used successfully by the average soldier handicapped by subzero conditions. This means equipment simple to operate, maintain, and supply.

Thus we see another logistical problem of national importance being solved through the joint effort of the Ordnance-Industry Team. Wheeled vehicles can now run in arctic temperatures to support air and ground operations, and other ordnance is being designed to meet the cold-weather problem.

"We have come a long way toward the solution of the arctic fuels-and-lubricants problem—much further in fact than the most optimistic . . . dared to hope for. . . . We have materials available which will permit satisfactory operation of most transport equipment at minus 65 degrees Fahrenheit. We feel we now have the experience and know-how necessary to improve these materials and solve our other arctic lubrication problems as well.

"More important still we have demonstrated that the Ordnance-Industry Team can function in peace as in war. What are the conditions that make this teamwork possible? Obviously industry must be willing to assist in the solution of military problems.

"In the opinion of the writer, however, the most important condition to successful Ordnance-Industry teamwork is a strong, capable, technical group within Ordnance which can present a clearly defined problem to industry and carry a proportionate share of the work load. When this condition exists the participants have a mutual respect for each other and the solution of military problems is greatly facilitated."—LIEUT. COL. G. F. POWELL, "Lubricants for the Arctic," in the January-February 1950 issue of ORDNANCE.

Body Armor in the Civil War

Breastplates Proved Effective But Soon Fell into Disfavor

Harold L. Peterson
Historian, National Park Service, U.S. Department of Interior

TO the average modern American, the word "armor" immediately calls forth a picture of European knights in full battle array. It is definitely associated with other ages and other lands. Yet body armor has played a part in every major conflict in American history, from the full suits of the early colonial wars to the helmets and flak suits of World War II.

The Civil War was no exception, and the outbreak of hostilities in 1861 brought a rash of inventions and proposals for body armor which continued through the early years of the war. Portable shields, which an infantryman could carry before him, were proposed on several occasions and received some support. A variety of breastplates were developed and tested; and one interested individual suggested to Secretary of War Stanton in 1862 that all artillerymen should be equipped with half armor consisting of helmet, cuirass, and vambraces to protect the forearm.[1]

Most of these proposals were ignored despite enthusiastic support in the newspapers. The breastplates, however, received a kinder reception than the others. They were tested and seriously considered by the Army, and they enjoyed a brief but widespread popularity through private purchase by individual soldiers.[2]

The Soldiers'
Bullet Proof Vest
Has been repeatedly and thoroughly tested with Pistol Bullets at 10 paces, Rifle Bullets at 40 Rods, by many Army Officers, and is approved and worn by them.
It is simple, light, and in a true economy of life—it will save thousands. It will also double the value and power of the soldier; and every man in an army is entitled to its protection. Nos. 1, 2, and 3 express the size of men, and No. 2 fits nearly all.
Price for Privates' Vest, $5. Officers' Vest, $7. They will be sent to any address, wholesale or retail.
Sold by MESSRS. ELLIOTT, No. 385 Broadway, New York, and by all Military Stores. Agents wanted.

Fig. 1. Advertisement appearing in Harper's Weekly for March 15, 1862.

Two Principal Types

The breastplates worn by the Union soldiers fall into two principal types. The most popular of these, the "Soldiers' Bullet Proof Vest," was manufactured by G. & D. Cook & Company of New Haven, Conn. (Fig. 1). It consisted of a regular black military vest containing pockets into which were inserted two thin pieces of spring steel, one on either side of the chest. When the vest was buttoned, the plates overlapped in the center.

The standard infantry vest weighed 3½ pounds, while a slightly heavier model for cavalry and artillery weighed 6 pounds. Some attempt was made to secure an individual fit by issuing the vest in three sizes—small, medium, and large. The price of the complete infantry vest for a private was five dollars; for an officer, seven dollars. An almost identical vest was manufactured by M. A. Benjamin, also of New Haven.[3]

The second most popular type of breastplate was made by still another New Haven firm, the Atwater Armor Company. It was a far more complicated product than the Soldiers' Bullet Proof Vest and cost about twice as much. The main body of the armor consisted of four large plates held together by a keyhole-and-rivet system. To the bottom of the cuirass formed by these plates were attached hinged tassets of two lames each. These could be easily detached by extracting the pins from the top hinges. (See Fig. 2. Original in the Confederate Museum, Richmond, Va.) The inventor, J. J. Atwater, even provided against the loss of these removable pins by chaining them to the plate above. When worn, the armor was held in position by broad metal hooks over the shoulders and a belt around the waist fastened by buckles on both sides. For ease in carrying, the whole cuirass could be quickly dismantled into six pieces of a relatively small and uniform size.[4]

Homemade Armor

In addition to these two primary types, there were also a variety of homemade specimens. An illustration of such a product is in the armory of the Washington Light Infantry of Charleston, S. C. (Fig. 3). It consists of two pieces of iron fastened together by metal straps at top and bottom. Two more crude straps supply support by hooking over the shoulders. In addition there is a third plate designed to be suspended beneath the others as a protection for the lower abdomen. This vest was reportedly taken from the body of a Union officer at Gaines Mills.

Comparatively few breastplates were

[1] Stephen A. Whipple to Cameron, July 29, 1861, *Letters Received, Secretary of War*, War Records Division, National Archives, W114. L. W. Finelli to Cameron, September 10, 1861, *ibid.*, irregular file, F136. N. D. Ferguson to Cameron, July 3, 1861, *ibid.*, F85. N. D. Sperry to Cameron, December 25, 1861, *ibid.*, S977. George Rogers to Stanton, April 19, 1862, *ibid.*, R260. Hereafter this set of papers will be cited as *LRSW*.

[2] *Philadelphia Inquirer*, July 17, 1861; January 18, 1862. *The New York Times*, January 18, 1862. *Frank Leslie's Illustrated Newspaper*, March 8, 1862. *Richmond Whig*, March 27, 1862. One source states that greaves were also manufactured, though they were never very popular. John D. Billings, "Hardtack and Coffee, or the Unwritten Story of Army Life," Boston, 1887, 275. No corroboration can be found for this statement. Billings also maintains, p. 278, that the brass shoulder scales first worn by the light artillery and then by enlisted men in all branches of the army were originally designed to ward off saber strokes from enemy cavalry. This is logical since the shoulders are a particularly exposed portion of the body and the brass would afford some protection, but no official substantiation for this statement has been located.

[3] *Leslie's*, March 8, 1862, 252, 254. *The Scientific American*, October 26, 1861, 264, 344. Advertisements for these vests appeared frequently in *Leslie's* and *Harper's Weekly* during the spring of 1862. Specimens of the plates from these vests may be found in a number of museums. However, a prolonged search has revealed only one specimen in which the cloth vest is still intact. This piece is in the museum of the First Corps Cadets, Boston.

[4] N. D. Sperry to Cameron, December 25,

Fig. 2. Breastplate by Atwater Company.

manufactured in the Confederacy. Metal was scarce, and manufacturing facilities were distinctly limited. The armor worn was either captured from Union troops or produced by local blacksmiths. An example of the workmanship of one such Southern smith is in the collections of the Chicago Historical Society.

Armor Effective

The body armor of the Civil War was highly effective in protecting the wearer from wounds in the area covered. G. & D. Cook & Company maintained that their vest would resist pistol balls at ten paces and musket balls at forty rods. Their claim was later supported by Army tests. More recently the Atwater Armor Company's plate was tested by the late Dr. Bashford Dean of the Metropolitan Museum of Art. He found that it would resist a jacketed bullet with a muzzle velocity of 800 foot-seconds fired from a .45 Colt automatic pistol at a distance of only 10 feet—a truly remarkable performance.[5]

There is only one instance on record in which the death of a soldier was caused by a missile penetrating one of these armor plates, and that was under most unusual circumstances. At the Second Battle of Corinth in the fall of 1862, Col. William P. Rogers of the 2nd Texas led one of the most gallant charges of the war against the Union troops in Battery Robinett. As if on parade, he rode at the head of his men across the open ground, threaded his way through the abatis, and jumped the ditch in front of the battery. Here his horse was killed beneath him, but he disentangled himself and continued on foot right up the embankment to the muzzles of the defending guns. There he received point-blank the last charge of grape in the possession of the Union gunners. Nothing could have withstood grape at that range, and with his death the spirit of the Confederate attack was broken.[6]

The breastplate worn by Colonel Rogers is now in the possession of the Wisconsin State Historical Society. It is a rough, handmade specimen somewhat similar to the one taken from the Union officer at Gaines Mills. The jagged hole made by the grapeshot is two inches across at its narrowest point, and the metal is greatly bent and torn, mutely attesting the force of the blow. Of particular interest, however, is a dent in the lower portion of the plate, indicating that one other shot had actually been stopped (Fig. 4).

In contrast to the Rogers' incident stand hundreds of accounts in which soldiers' lives were saved by these pieces of armor. Memoirs of the period and contemporary newspapers are filled with such stories.

Fig. 3. Union armor from Gaines Mills.

Fig. 4. Section of breastplate worn by Colonel Rogers at Battle of Corinth.

During the brief period of their popularity, steel breastplates were made and worn by the thousand, although they never became regulation in either army. The first advertisements appear in the newspapers of early 1862, and the regiments fitting out at that time supplied a ready market. Over fifty per cent of some organizations were equipped with these devices. In one day an agent of the Atwater Armor Company recorded 200 sales. Throughout the year breastplates were worn in all theaters of the war. They were most prevalent in the Peninsular Campaign, but their appearance is also recorded at Shiloh and Corinth. After the Second Battle of Corinth there is no more mention of body armor in either memoirs or newspapers.

Armor Abandoned

There were several reasons why the practice of wearing armor did not continue. The infantry soldier particularly objected to the extra weight and bulk. Officers and cavalrymen had facilities for transporting their baggage and so were less troubled by the weight.

Probably the chief factor in discouraging the officers and cavalry was the ridicule to which they were subjected by comrades who did not avail themselves of the extra protection.

It was the combination of inconvenience and ridicule that brought an end to the practice. Unable to combat the declining market, the breastplate manufacturers were soon forced out of business. The brief boom was over, and armor once more disappeared from the American scene, not to reappear in quantity again until World War I.

1861, *LRSW*, S977. Sheldon B. Thorpe, "The History of the Fifteenth Connecticut Volunteers," New Haven, 1893, 15.

[5] *Leslie's*, March 8, 1862, 252, 254. *Harper's*, March 8, 1862, 160. *Daily Richmond Whig*, March 27, 1862. *The New York Times*, January 18, 1862. *Philadelphia Inquirer*, January 18, 1862. Bashford Dean, "Helmets and Body Armor in Modern Warfare," New Haven, 1920, 58n.

[6] There is a somewhat gory photograph of Colonel Rogers' body in Francis Miller's "Photographic History of the Civil War," 10 vols., New York, 1911, II, 145.

The Counter Chronograph

Electronic Device for Measuring Bullet Velocities

by

Philip B. Sharpe

A significant advance has been made in the science of ballistics

THE interesting thing about the recording of small-arms projectile velocities is the amazing lack of understanding of just what is recorded, how, and the precision of the answer. This article will attempt to simplify the picture.

When a ballistic report comes in it may contain figures marked "muzzle velocity" or "instrumental velocity." What is the difference?

Velocities are obtained with an instrument called a chronograph; the word literally meaning *chrono*, time, and *graph*, record. But we desire a speed record, not a time record. The chronograph gives a time record of the flight of the bullet between two points and this is then translated into the average speed at the midway point, called "instrumental velocity." From this, "muzzle velocity" is "calculated."

For more than half a century the standard instrument for velocity recording has been the complicated and permanent installation called the "Boulengé," after the French designer. It is complicated in operation, occupies much space, and requires one crew for operation and another for maintenance. The unwieldy Boulengé functions by the laws of falling bodies with mechanical-delay corrections. What has long been needed, however, is a portable or semiportable unit, and for forty years this has been a subject of research.

Solved by Electronics

The field of electronics indicated the solution. There John T. Potter, of the Potter Instrument Company of Flushing, N. Y., saw possibilities. He set to work with Army Ordnance engineers at Aberdeen Proving Ground to develop an electronic counter to record the precise time interval between two points. The first unit was tested there in July 1943.

Those interested in the technical aspects of the counter or interval timer may obtain reprints of articles appearing in the publication *Electronics* by requesting them from the Potter Instrument Company, since the subject cannot be completely covered here.

Mr. Sharpe is a nationwide authority on small arms and their ballistics, and has long been a regular contributor to ORDNANCE. He is the author of "The Complete Guide to Handloading" and "The Rifle in America."

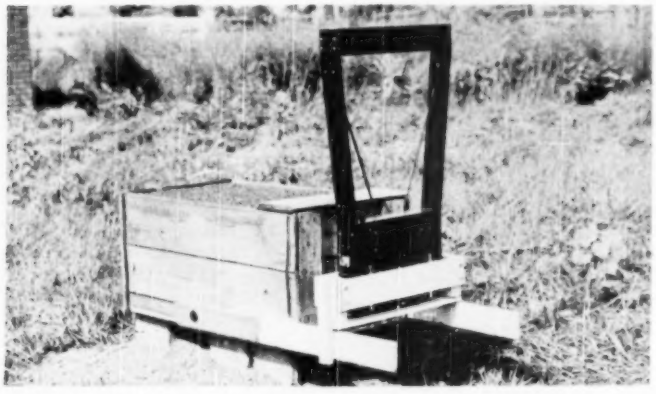
Two basic models are produced by Potter. The most commonly used is the 100-kilocycle model in which a quartz crystal, oscillating 100,000 times a second, is the heart of the instrument. To that Potter added a fully electronic unit which counts the oscillations and presents them to the operator in the form of a visual record. It is necessary to utilize some device whereby a bullet passing one point will immediately start the timer counting and stop it at another point.

Another Potter model utilizes a 1.6-megacycle oscillator. This has an accuracy 16 times as great, reading to 1/1,600,000th of a second.

The most practical unit used to operate the counter for small-arms recording is the photoelectric screen.

The photoelectric screen is neither a "screen" nor does it take photographs. The unit contains an electronic tube called a photocell which is acted upon by a light source. The nose of a bullet entering the sensitive area casts sufficient shadow to cause the photocell to generate an electric impulse. An amplifier in the unit expands this tiny charge to a workable strength of 80 volts DC, and a cable transmits this to the counter, thereby starting it. A similar impulse from the second screen stops the counter.

The standard Potter screens have a frame and chassis of sheet aluminum. In the superstructure is a standard 17¾-inch clear lumiline lamp. Below this, in the base, or amplifier housing, is the photocell. The sensitive area is great—17 inches wide at the top, 20 inches deep, tapering to one inch wide over the photocell—sufficient for the



Hood removed, the sandbox protector for the amplifier and the mount for the photoscreen are visible in a simple and utilitarian arrangement for testing.

A canvas cover over a light frame offers effective shade and weather protection to the sensitive photoscreens to insure proper functioning of the photocells.

firing of rifles or pistols offhand, thus eliminating the necessity for an elaborate machine rest.

Photocell Principle

The photocell principle is similar to that of the "electric eye" employed to open and close doors. However, with a bullet moving along at 4,000 feet a second, high sensitivity is required. A thyratron discharge circuit picks up that slight change in light intensity as the bullet nose interrupts the light beam, builds it to an 80-volt positive charge, and within fifteen microseconds passes it to the counter to "gate" it into operation. That delay is canceled out by a similar delay in the stop circuit.

What is the accuracy of the instrument? With screens 100 feet apart, the Potter can be read up to about 1½ foot-seconds at the 4,000-foot-second level, about one foot-second at the 3,000-foot-second level, and more closely at lower velocities.

About a year ago I decided that the Potter was the answer to my prayers. I add up to a one-man crew, and I needed a one-man instrument. The Potter was already well known—there are installations at Aberdeen Proving Ground, Frankford Arsenal, Watertown Arsenal, Remington, Olin, Western, the Naval Gun Factory, California Institute of Technology, National Bureau of Standards, Federal Cartridge Company, and General Electric, as well as in the research laboratories of Wright, Langley, and Eglin Air Force Bases and dozens of other research laboratories.

First of all I sought information on how I could use and install the unit. I visited half a dozen establishments where many of these were in service and talked with the men who handle them. I gathered notes on suggested minor improvements and studied screen installations. All installations differed, various applications being figured out by the users the hard way. I then went to the Potter plant to order my instrument, told them of the changes desired, and why. They listened and accepted the order.

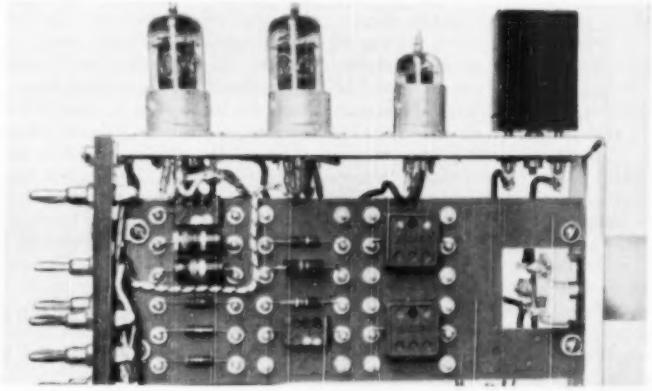
The current interval timer is known as the Model 440, replacing the earlier Model 80. This has four recording counter decades reading to 0.09999-second. Since a screen can readily be installed at 100, 200, or 300 yards for the recording of time of flight which will run into tenths of a second, I requested an additional decade so I could read 0.99999-second. They gave my instrument a new number—451A.

My unit is built into a single cabinet 21 inches wide, 15 inches deep, and 14 inches high, and weighs about 75 pounds. It draws 155 watts at 115 volts, 60-cycle AC. A separate power supply to each 80-watt photoscreen plus the paired impulse return lines from each to the counter indicated a mass of trailing wires. This was solved by building a special wall-box unit near a window through which shooting is conducted from my range house. This was permanently attached and neat wiring run to terminals of the counter.

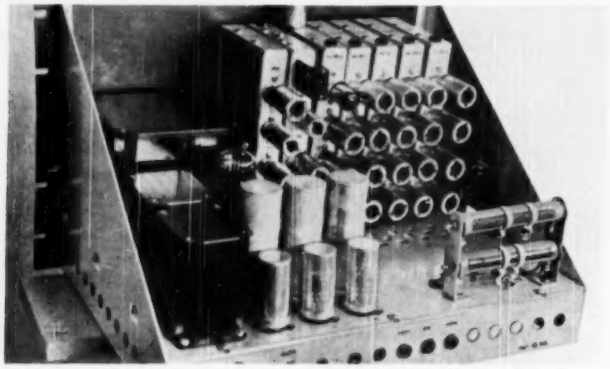
Screen Distance

What screen distance to use? Various installations fail to agree on this point, depending on the accuracy desired. Calculation revealed that 100-foot separation permits readings as close as 1½ f.s. at 4,500 f.s. For pistol and revolver work up to 1,800 f.s., a 30-foot separation is adequate. From gun muzzle to the first screen is 10 feet, since the blast from some high-velocity guns is severe. Frankford uses the 100-foot separation but installed the initial screen at 28 feet merely to achieve 78-foot instrumentals for comparison with their earlier Boulengé records.

In checking installations I learned much of value. You can set those screens in the open and shoot through them. Then one shot gets away from you, plows through the amplifier section—possibly on both screens—and



This side view reveals the clean wiring in the oscillator decade. Oscillator crystal is contained in the black plug-in unit located on top of the chassis.



This rear view of the Potter counter shows the decades with shielded tubes, plugged into the chassis. The compact design is an outstanding feature.

you suddenly become $360 poorer! Since the amplifier section is the critical part, that is the point to protect. Most laboratories visited had shot up screens and had tried everything for protection, including armor plate. The latter doesn't work because shock waves from the bullet sometimes impact the armor in advance of the bullet, creating a harmonic which can trip the thyratron discharge circuit, creating a false reading. Frankford had solved the problem in a satisfactory manner—a sandbox three feet deep.

I built these protectors and installed them on concrete building blocks on my range. Each holds some 600 pounds of sand.

The manufacturers report: "Since the screens carry their own light source, they may be used outdoors in daylight." This is only partly true. I found that with the sun shining on the photocell at an angle, a bullet passing through the normally sensitive area can cast its shadow other than on the phototube, resulting in a "no record" shot. The solution was simple: a light framework to support tarpaulin shades.

The screens should be precisely placed as to predetermined distance. The horizontal plane was laid out with a transit. A socket was built on the front of each sandbox to fit the amplifier after padding it with sponge rubber to eliminate ground shock waves. There is sufficient swing in each socket to permit a perfect vertical through the use of a level.

Since the power supply and return impulses run through cables to a common screen connector, either a 4-wire cable, or two 2-wire cables may be used. About 18-gauge wire is ample for power input and 22-gauge may be used for the pulse lines. I use two paired cables taped together at 8-inch intervals. Hand-formed coils soon developed kinks and snarls and were replaced with small reels, making handling easier. Reels are hung on racks with one end connected to the junction box. They may be quickly reeled to the screens and the cable plugged into its screen socket. Installing the screens for firing requires six minutes.

To check the installation before firing laboratory-grade ammunition I keep a little .22 rifle handy and fire a shot through the screens.

One-Man Operation

Operation of the chronograph is a simple one-man job. From shooting position at my bench I reach over, press the "reset" button, and two neon lamps marked "Start" and "Stop" are lighted. The shot is then fired through the screens. The first screen impulse starts the banks of neon lights flickering; the second stops them. A pattern of neon lights remains lighted in each of the five columns of lamps, four deep. Lamps are numbered from bottom to top, 1, 2, 4, and 8. Where no lamps in a column remain lighted, the reading is zero. On one test, in the second column the 4 was lighted; in the third, 1, 2, and 4; in the fourth the 8 is on, and in the fifth, the 1. Thus the time it took that bullet to cover 100 feet is read 0.04781-second. The 100-foot distance is divided by this figure to get the translation of 2,090 feet per second.

Actually I translate through the use of graphs prepared for me by that noted ballistician, Prof. R. Cushman Wyckoff, head of the Department of Physics at the University of Oklahoma. With Wyckoff's graphs, translation is to one foot-second.

The reading remains on the panel lights until the reset button is pressed to clear. The operator is then ready to fire another shot for record.

Some Suggestions

Such an outfit as described above is well within the reach of the smaller laboratories. There are a few suggestions. Remember that the photoscreens are very sensitive and can get out of adjustment. It is well to have a spare on hand to prevent interruption of test work. Wiring diagrams and test data are supplied with each instrument.

It is also wise to maintain spare tubes—at least one of each of the ten different types used in the counter and amplifier. My 5-decade counter has 28 tubes and each photoscreen has 5.

In recording velocities with, say a 10-shot string, the translated velocity figures are added together and divided by ten to get the average or mean instrumental velocity. The individual-shot velocities are then compared with the mean, their differences added, and the figure again divided by ten to get the mean variation.

Use of the Potter counter chronograph has another great advantage. By using the photoscreens and a properly installed distant target, ordinary guns may be fired for accuracy groups at the time the velocity is being recorded. Since the use of the Boulengé requires that a muzzle wire be cut and the bullet interrupted by a disjunctor, usually of an impact type, accuracy shooting cannot be fired with velocity tests.

Before World War II all major establishments testing for velocity used the Boulengé exclusively. Today all use the Potter, and in many, the older type is being scrapped. With the Potter, several counters may be connected with screens hooked up so any number of velocity checks may be made of an individual shot at any desired point. This permits an actual record of what had previously been theoretical paper work on bullet performance. The science of electronics scores again!

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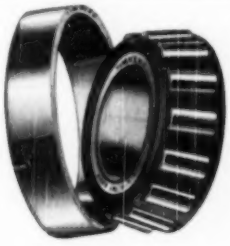
TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⓡ AND THRUST →ⓣ← LOADS OR ANY COMBINATION →ⓡⓣ←

WHAT A SIGHT for a hunter's sights!

What sportsman has ever lost the thrill of getting a whitetail like this one within range! And fortunately it is an experience hunters in many parts of the country will have regularly again this season.

In fact, wildlife stocks of many kinds are more abundant today and await your hunting pleasures. Wise conservation practices have brought this about and are helping to assure game stocks for tomorrow. Continue your cooperation by joining and supporting your local and national organizations for game preservation and restoration.

E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington, Delaware.

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HOW TO START A RIFLE CLUB

Free booklet about shooting—gives information on how to set up a rifle club in your own community... how to teach your group to have more fun shooting a rifle... how they can win Ranger Shooting Emblems. No obligation. Write: Sportsmen's Service Bureau, Dept. D-3, Sporting Arms & Ammunition Manufacturers Institute, 343 Lexington Ave., New York 16, N. Y.

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